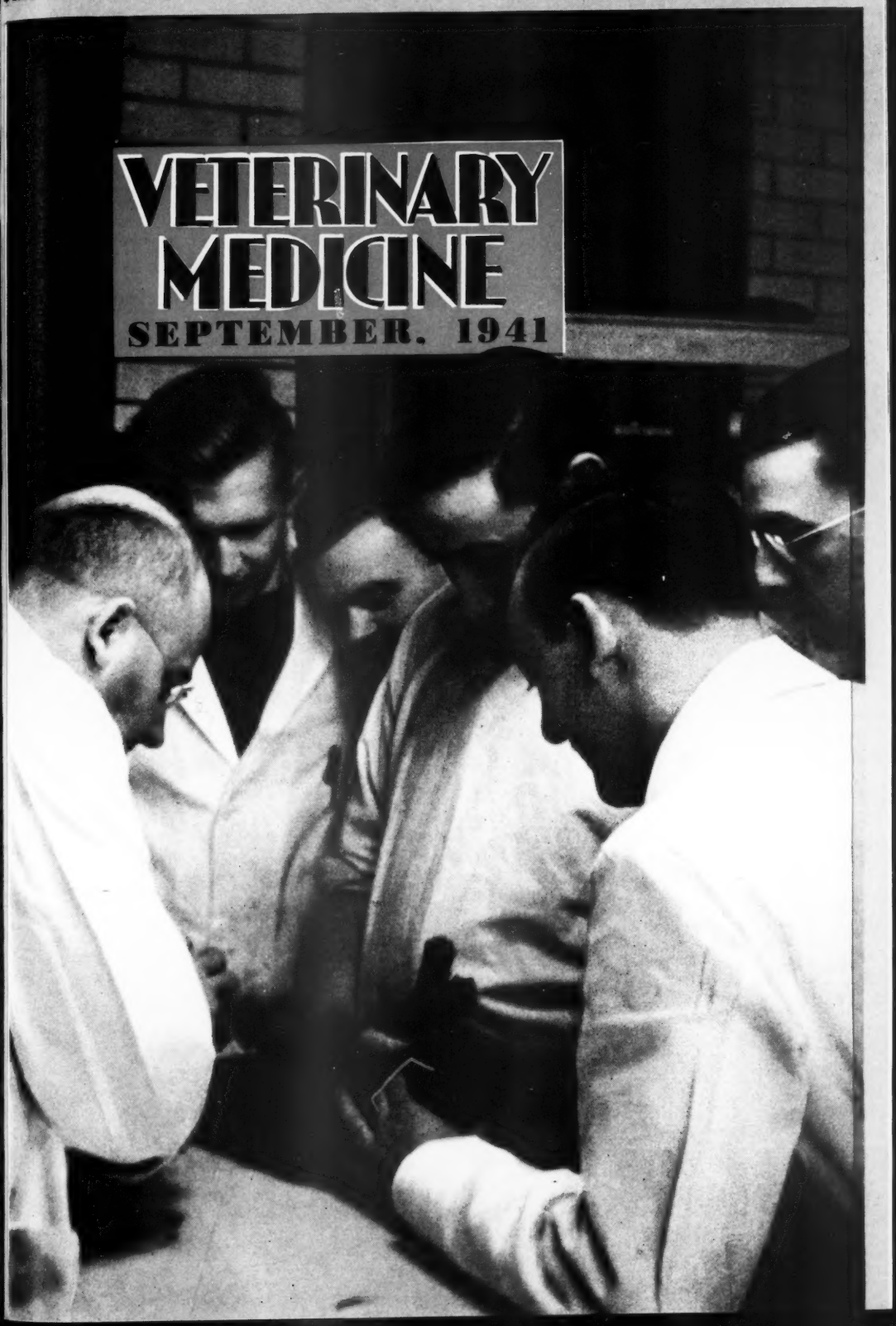
$4.00 a Year Forestry Published Monthly AUG 17 1941 50c a Copy

VETERINARY MEDICINE

SEPTEMBER, 1941



"ALL-IN-ONE"

Jen-Sal

CANINE DISTEMPER

Prophylaxis Package

Made possible through the use of long-dated liquid Distemper virus

•

You

PAY NO MORE

for this package

•

The price is the same as if the vaccine and virus were purchased separately.

•

LET THIS NEAT PROFESSIONAL PACKAGE SELL DISTEMPER IMMUNIZATION FOR YOU!

Each package contains two 5-c.c. doses of Canine Distemper Vaccine, one dose of liquid virus, one vaccination certificate, and one folder on Dog Distemper for your client. The package is made up on receipt of your order, thus insuring the use of fresh vaccine and virus at all times.

Write for a FREE supply of Canine Distemper booklets for distribution to your clients—they will save valuable time in answering the owners' questions. If you wish your name and address on the folders, there will be a charge of 75 cents to cover the cost of printing.

1 Complete Canine Distemper Prophylactic Treatment . . . . . $2.00 Code: DISCO

(Less discounts of 10 and 2 per cent)

JENSEN-SALSBERY LABORATORIES, INC.

KANSAS CITY, MISSOURI

25
NEMAZENE TABLETS
(REG. U. S. PAT. OFF.)
12.5 Gm.
Each tablet contains 12.5 Gm. of Phenothiazine.
PARKE, DAVIS & CO.
DETROIT, MICH., U.S.A.
A New Veterinary Anthelmintic for oral administration or mixing with feed

NEMAZENE TABLETS

(Phenothiazine, 12.5 Grams)

To the medicinal grade of phenothiazine contained in each Nemazene Tablet we have added a special "wetting agent" which hastens disintegration—about 1 minute in warm water. The resulting uniform suspension can be readily and quickly mixed with feed or given as a drench, without preliminary fasting. Animals also swallow the tablets readily when administered with Nemazene Forceps or a balling gun.

Nemazene Tablets are available in boxes of 25 and 100.
For descriptive literature and detailed information address

Animal Industry Department of

PARKE, DAVIS & COMPANY

DETROIT, MICHIGAN WALKERVILLE, ONTARIO

VETERINARY MEDICINE

Registered in U. S. Patent Office

VOL. XXXVI SEPTEMBER, 1941 No. 9

Published Monthly by the

VETERINARY MAGAZINE CORPORATION

7632 S. CRANDON AVE., CHICAGO, ILL., U. S. A.

$4.00 a year; per copy 50 cents; Special Issues $1.00

All matter appearing in this publication is copyrighted. No part of it may be reproduced without specific permission. Permission will be given if the purpose is unobjectionable. If there be any question as to the propriety of reproduction the author will be consulted.

Entered as second-class matter Nov. 8, 1920, at the post office at Chicago, Ill., under the Act of March 3, 1879. Entered as second-class matter under the title of American Journal of Veterinary Medicine July 19, 1910, at Chicago, Ill., under the Act of March 3, 1879.

D. M. CAMPBELL, *Editor*
7632 S. Crandon Ave., Chicago, Ill.
Telephone South Shore 7160

H. J. MOSTYN, *Eastern Representative*
1265 Broadway, New York, N. Y.
Telephone Murray Hill 4-4037

COPYRIGHTED, 1941, BY VETERINARY MAGAZINE CORPORATION

CONTENTS

Veterinary Progress, Policies, and Comments 437-448

Retail Food Seller Held Liable for Tularemia Infection, 438; Death-Dealing Profits on 1000 Fowl, 438; Protected Protective Food, 438; Adulteration of Food, 438; Supervise All Markets, 438; Veterinary Staff, Iowa State College, 439; Veterinarians and Live Stock Producers Cooperate in Colorado, 440; Meat Animal Production Increasing, 440; Professional Training in Veterinary Medicine at University of California, 441; University of Illinois Offers Preprofessional Veterinary Courses, 441; Helpful Literature, 441; St. Louis Encephalitis, 442; Unanswered Questions, 442; Encephalomyelitis in 1941, 444; Good Horse Sense, 444; The Largest Cavalry Post, 445; Good Care of Cows Profitable, 446; 500 Trichobezoars, 446; Hog Cholera, Swine Erysipelas and Enteritis from a Community Sale, 447; Phenothiazine Poisoning in Swine, 448.

Contributing Factors Causing Death in Sheep Infested with the Nodular Worm—D. F. Eveleth and N. W. Hilston 449

Equine Abortion and Diseases of Foals—Wm. E. Jennings 452

Recent Materia Medica XIII. The Gonadotropes—Victor Lewitus 465

Malignant Edema in a Colt—A. R. Cowser 469

Fracture and Displacement of the Tuber Coxae—E. J. Keller 469

Ticks and Their Importance in Small Animal Practice—F. R. Koutz 470

Plants Poisonous to Live Stock in New York 474

An Anomaly of the Foot in the Dog—Harris W. Hantman 478

Radial Paralysis in a Cow—Marvin Stitt 480

Pre-Operative Use of Sulfanilamide—Myron D. Reed 480

Effects of Phenothiazine on the Equine Blood Picture—Clair Toynton 481

Abstracts 482-484

Cows "Hold Up" or "Let Down" Their Milk, 482; Pathogenesis and Treatment of Azoturia, 482; Treatment of Paralysis of the Retractor Penis in the Horse, 482; Sodium Citrate in Veterinary Therapy, 483; Human Vaccination Against Brucellosis in France, 483; Durable Immunity Conferred by Tetanus Anatoxin, 483; Gas Gangrene of Cattle and Its Prevention, 484; Actinomycosis in Dogs and Cats, 484; Studies on the Diagnosis of Subcutaneous Emphysema, 484.

THE FRONT COVER

Turn to page 443 for a description of the clinic scene portrayed.

VETERINARY MEDICINE

Registered in U. S. Patent Office

Leading Publication in the Veterinary Field for More Than Thirty Years

VOL. XXXVI SEPTEMBER, 1941 No. 9

The Rockefeller Foundation is supplying yellow fever vaccine to the United States Army and also to the United States Public Health Service. They expect to produce more than a million doses of this vaccine.

* * * *

Senate Bill 1652, introduced by Senator Bone of Washington, provides for medical care, subsistence and treatment in private hospitals and medical attention by civilian physicians and surgeons, for officers and enlisted men in the military and naval forces of the United States, when on an authorized furlough or leave of absence.

* * * *

At the present time there are a few over 600 veterinary officers on active duty in the army. These include Regular officers, Reserves, National Guard and one or two retired officers. Of the 1500 veterinary reserve officers slightly more than 400 are now assigned to active duty in the army. In addition to commissioned personnel there is an enlisted complement of 2,200 men.

* * * *

At the request of the Surgeons General of the Army and Navy the Red Cross has begun the creation of a reservoir of 10,000 units of dried blood plasma, to be used for emergency transfusions in the Army and Navy, also among civilians injured in disaster. The Red Cross plans to store liquid plasma too. Donors are being listed in New York and Philadelphia areas and as needed will be enrolled elsewhere through other chapters of the Red Cross. The processing of whole blood for producing plasma is being done at the Sharp and Dohme laboratories in Philadelphia.

That inexpensive substitutes for novocaine, for antiseptics, and possibly for sulfanilamide will soon be made from corn cobs, oat hulls and other waste products, was a statement recently made to the American Chemical Society, by Dr. Henry Gilman, professor of chemistry at Iowa State College, Ames.

* * * *

A law to prevent the manufacture or sale of animal biological products, including serums, vaccines, bacterins, viruses, except under license from the division of serum-virus control of the United States B.A.I., was enacted recently by the Colorado legislature. This act does not apply to products manufactured under U. S. veterinary license. Violation of the new law calls for $100 to $500 fine, or 30 days to one year's imprisonment.

* * * *

Ackert and associates found the oriental rat flea *Xenopsylla cheopsis* on rats trapped on the city dump at Manhattan, Kansas, and determined that these fleas lived over winter in that locality. *X. cheopsis* has been the source of bubonic and other plagues which have taken uncounted millions of lives in the past. Its prime importance in the interior of the United States, however, is probably in connection with sylvatic plague, which has spread slowly eastward in the United States since its introduction in San Francisco 41 years ago. The oriental rat flea also was first discovered in coastal cities in 1900. Sylvatic plague has now extended east to New Mexico and Wyoming and the oriental rat flea, always ahead of it, has been found as far east as Ohio.

Retail Food Seller Held Liable for Tularemia Infection

The Ohio Supreme Court recently held that when a provision company advertises the sale of rabbits, even if the rabbits were sold by a lessee of the company, it is held liable as though it had itself made the sale. It was held that when some of these rabbits proved to have had tularemia and thus caused serious illness of the purchaser there had been a violation of the state pure food law and therefore a basis for action.

Death-Dealing Profits on 1,000 Fowl

In a western city several months ago a wholesale catering establishment sent 1,000 spoiled chickens to a banquet. Luckily, one of the chefs discovered the unpalatable state of the fowls. Laboratory tests revealed that had the guests eaten the chickens all of them would have been poisoned and some of them probably would have died.

However, the wholesale catering company took back the fowls and gave every evidence of planning to make another try at selling them. They even tried to take the chickens to a cold storage plant to be kept pending a sale; but storage men refused to accept them because of their obviously spoiled condition.—*Hygeia.*

Protected Protective Food

Existing data clearly prove that the common mistakes in food habits are failures to ensure adequate supplies of vitamins and minerals. Nutritionists have classified foods which furnish excellent quantities of these constituents as protective foods. This simple name indicates the function of these foods: they protect against malnutrition and consequent ill-health. The common protective foods are: Milk, butter, cheese, eggs, meat, fruits and vegetables, whole-grain cereal products. Milk is our most valuable protective food. So much attention has been given to the proper handling of milk in recent years that it is proper to refer to milk as a protected, protective food.—*Can. P. H. Jnl.*, 32:4, 1941.

Adulteration of Food

Few of those who speak glibly of the adulteration of food know the precise legal meaning of the term.

The Food, Drug and Cosmetic Law defines a food product as adulterated . . .

1. "if it is in whole or in part the product of a diseased animal, or of an animal which has died otherwise than by slaughter." Section 402 (a) (5).

2. "if it consists in whole or in part of any filthy, putrid, or decomposed substance, or if it is otherwise unfit for food." Section 402 (a) (3).

3. "if any substance has been added thereto or mixed or packed therewith so as to increase its bulk or weight . . . or make it appear better or of greater value than it is." Section 402 (b) (4).

Supervise All Markets

So long as any Tom, Dick or Harry can open a private stock yards and start selling live stock without license or supervision there will be increasing abuses in live stock marketing. The desire for gain is bound to result in advantage being taken of the seller in one or more of the many ways known to sharp operators. Recent exposures of these practices have been appearing in leading farm papers, with the result that many producers are today thinking about ways and means of raising the standards on all markets.

Standards and basis of operation of all markets in Ohio have recently been defined in a bill now passed by the legislature which requires each market, large or small, to secure and maintain a license. The bill is drafted after the Federal Packers and Stock Yards Act, which applies only to stock yards having 20,000 square feet or more of yard space. Ohio stockmen, the Grange and the Farm Bureau would extend the same protection to Ohio producers who sell on all the markets under 20,000 square feet. Administration of the act will be vested in the State Department of Agriculture. Unfair operating practices will be eliminated under such legislation when administered in the interests of fair trading.—*National Live Stock Producer.*

FACULTY OF THE DIVISION OF VETERINARY MEDICINE, IOWA STATE COLLEGE

Front Row (Left to Right): W. G. Venzke, E. V. Beamer, L. E. St. Clair, F. M. Birch, F. D. Blohm, E. A. Corfe, S. H. McNutt, T. S. Leith, J. B. White, H. J. Griffiths.

Second Row: R. D. Hatch, H. L. Foust, R. A. Runnells, Hilma Dodds, Wilena Griggs, Velma Smith, Margaret Sloss, Lois Meyer, Lois Calhoun, Chas. Murray (Dean), L. H. Schwarte.

Third Row: F. E. Walsh, R. A. Packer, L. M. Jones, D. A. Smith, T. W. Stearns, C. H. Covault, I. A. Merchant, E. A. Benbrook, S. G. Kenzy.

Back Row: M. J. Johnson, H. E. Biester, H. D. Bergman, G. R. Fowler, E. A. Hewitt.

Faculty members absent when the photograph was taken include C. D. Lee, W. H. Chivers, H. C. Nowlin, and C. G. Deal.

In the appropriation bill for the University of Wisconsin, an item of $15,000 for fox and mink research had been omitted, but Gov. Julius P. Heil saw to it that this item was restored to the bill.

* * * *

The University of Chicago recently announced a home study course in meat packing, similar to the one now being offered on the campus. The course is sponsored by the University and the American Meat Institute. These courses will train packers needed to prepare the billions of cans of meat necessary for the army.

* * * *

During the past year the Rockefeller Foundation gave $10,000 to the University of Pennsylvania for research on the properties of red blood cells. Columbia University was given an appropriation for researches on the biochemistry and genetics of cystinuria in dogs, also a grant of $42,000 (payable over a two-year period) for research in endocrinology.

A fire occurred recently on the campus at Kansas State College. Two frame buildings, originally constructed by the Federal government in 1918 to house enlisted men, but later converted into a small-animal laboratory, were destroyed. The greatest loss consisted of strains of guinea pigs, developed through more than twenty years, which were used in genetics classes.

* * * *

The Royal College of Surgeons, London, suffered great loss recently when incendiary bombs fell on the roof of the building which houses many of its treasures. The skeletons of kangaroos brought by Capt. Cook from Australia were among the thousands of museum pieces destroyed. The 4000 comparative osteology specimens, conceded to be the finest in the world, were also lost. Many original surgical instruments are missing; however, those used by Lister have been recovered. Doubtless the most serious loss was that of the invaluable Army Medical War Collection, which contained plaster casts of every type of wound.

Veterinarians and Live Stock Producers Cooperate in Colorado

Dr. R. M. Gow, State Veterinarian of Colorado, has been reappointed Live Stock Commissioner of the state. The appointment of a five-member board of Live Stock Inspection has also just been made by Gov. Ralph L. Carr. In addition to Dr. Gow, Dr. Paul Taussig, a veterinarian and prominent Hereford breeder, has been made a member of this board.

LEADERS WHO PLANNED CONTROL MEASURES FOR BOVINE BRUCELLOSIS.

Left to right: Dr. R. M. Gow, State Veterinarian, Denver, guest; Field Bohart, Colorado Springs, committeeman; Dr. A. H. Francis, field inspector federal B.A.I., Denver, guest; Dr. Paul Taussig, Parshall, committeeman; C. W. Henry, Greeley, guest; Jim White, Denver, guest; Dr. B. F. Davis, executive secretary Colorado Stock Growers and Feeders Association, Denver, committee secretary

Courtesy National Live Stock Producer

With the cooperation of Drs. Gow and Taussig, the Colorado Stock Growers and Feeders Association of Denver has initiated a state-wide voluntary program for control of bovine brucellosis in range cattle. The committee which formulated the program consists of Dr. Paul Taussig and two other members of the association together with its secretary, Dr. C. L. Davis. Dr. Gow and Dr. A. H. Francis, field inspector for the Federal Bureau of Animal Industry, acted as technical advisors.

The committee advises stockmen who have had losses from abortion to have their herds tested for brucellosis, and, if it is present, to adopt the recommended control measures.

The program calls for the use of the test-and-slaughter method, the calfhood vaccination plan, or a combination of both, depending upon the circumstances. The procedures most suitable under various conditions are outlined in a report drafted at the latest meeting of the committee. The report comes out strongly against any attempt to make slaughter of reactors compulsory, saying, "We believe it to be economically unsound, as it unnecessarily compels the slaughter of many valuable breeding animals, and by this method Bang's disease cannot be eradicated nor controlled in beef breeding herds under range conditions."

* * * *

Meat Animal Production Increasing

Last year more than 123 million head of cattle, hogs and sheep moved from farm to market and processor to provide a total of 18,712,000,000 pounds of meat, the greatest amount consumed in any year in history and a gain of 1,289,000,000 pounds over the previous year. The production of meat animals on America's six million farms last year brought a cash income of $2,390,000,000 to our stockmen and we have, at last reports, a meat animal production exceeding 143 million head.—*R. C. Pollock.*

Professional Training in Veterinary Medicine at University of California

The signing by Governor Olson on July 9th of Assembly Bill No. 15 makes it possible for the University of California to offer a professional course in veterinary medicine. Although the various details of the new curriculum are still in the preliminary stages and the necessary administrative and academic procedures yet remain to be formulated, the announcement is made that, beginning with the fall semester, 1941, a six-year course of study leading to the degree of Doctor of Veterinary Medicine will be inaugurated.

The first three years of the course will follow closely the present curriculum in animal science in the College of Agriculture. Although it is recommended that all of the first three years of the course be spent in residence at Davis because of the close relationships between veterinary medicine and animal, poultry, and dairy husbandry, the first and second years may be spent in the University of California at Berkeley or Los Angeles, or in a junior college or other collegiate institution. The third year must be spent at Davis. The third year will contain certain courses not included in the animal science curriculum but which nevertheless will be acceptable as electives toward the B.S. degree in this curriculum, for those who do not continue in the veterinary program. The bachelor's degree will also be conferred at the end of four years upon students enrolled in the veterinary course, after which two more years of graduate work will be required for the doctorate in veterinary medicine.

As in the Medical School the number of students admitted to the professional veterinary courses will be limited, preference being given to residents of California who have attained high scholastic standing and who show particular aptitude for veterinary medicine. Applicants who fail to gain admittance to the professional veterinary course may, if they desire, proceed with the fourth and last year of the animal science curriculum.

Time and future appropriations will be required to complete the physical facilities that will be needed for the professional courses and to assemble the staff. It is expected that these will be added year by year as the freshman class entering in August, 1941, progresses through the six-year course. It will not be possible, therefore, to accept students with advanced standing for the present.

* * * *

University of Illinois to Offer Preprofessional Veterinary Courses

The University of Illinois, through Dr. Robert Graham, head of the Department of Animal Pathology and Hygiene, announces preprofessional courses in veterinary medicine to be offered at the University beginning with the fall semester. Doctor Graham says: "The preveterinary program is designed to meet the needs of students desiring a broad foundation for a course in veterinary medicine. A student who contemplates spending one or two years in preprofessional training should consult and comply with preveterinary requirements of the veterinary school that he plans to attend."

* * * *

Helpful Literature

Department of Agriculture bulletins of interest to veterinarians, all of which may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., include:

Emulsions of Wormseed Oil and Carbon Disulphide, Bulletin 1332.

Death Camas Poisoning, Bulletins 1273, 1376, 1012, and 1240.

Anthrax, Bulletin 1736.

Hog Cholera, Bulletin 34.

Tape Worms in Poultry, Bulletin 338.

Breeds of Draft Horses, Bulletin 619F.

Horse Bots, Bulletin 1503.

Stock Poisoning Plants of the Range, Bulletin 1245.

Tuberculosis in Hogs, Bulletin 781.

Hemorrhagic Septicemia in Cattle, Bulletin 1018.

Udder Diseases of Dairy Cows, 1422F.

A nominal charge is made for each of these bulletins.

St. Louis Encephalitis

To the dangers inherent in the spread of the eastern type of equine encephalomyelitis to sections west of the Appalachian mountains must be added another complicating factor: that of St. Louis encephalitis.

St. Louis encephalitis (human "sleeping sickness") was first recognized in 1933, when it attacked about one person in every thousand in the St. Louis area. A second epidemic occurred in St. Louis in 1937, and the disease has been identified elsewhere in the United States.

Confusion between human encephalitis caused by the St. Louis virus and that caused by western equine encephalomyelitis virus was remarked as early as 1939, when the findings on a small epidemic in North Dakota were reported. Clinically, the disease resembled St. Louis encephalitis, but there were certain pathological differences. Of six patients that recovered, serum from only one neutralized the virus of St. Louis encephalitis; serum from four neutralized the virus of western equine encephalomyelitis.

In the late summer and fall of 1940 there occurred two outbreaks of encephalitis affecting both human beings and horses; one in Weld County, Colorado, and the other in the Yakima valley, Washington. Clinical, epidemiological, and laboratory studies of these outbreaks indicated strongly that in horses and men alike, both western equine encephalomyelitis virus and St. Louis encephalitis virus were involved—in some cases one virus, in some cases the other, and in some, both.

Experimental inoculation of horses with St. Louis encephalitis virus produced in them clinical symptoms indistinguishable from those of western equine encephalomyelitis.

Tests were made on the blood serum of eight horses from a district in western Montana, where outbreaks of equine encephalomyelitis had occurred in 1936 and 1937. Of these eight animals, three which had recovered from attacks of encephalomyelitis showed protection against both the St. Louis encephalitis virus and that of western equine encephalomyelitis; two which had been in the same section at the time of the outbreaks, and which could have suffered immunizing infections without developing clinical symptoms, also showed protection against both viruses; the other three, which had been foaled after the outbreaks, failed to show protection against either. Since it has been demonstrated that there is no immunological relationship between the two viruses, the presumption is that the St. Louis virus was present, although unrecognized, in the Montana outbreaks. The possibility presents itself that this may be true in other localities also, and that cases of apparent recurrence of the equine disease, or of vaccination failures, may in some instances be due to invasion by the St. Louis virus.

As in the case of both types of equine encephalomyelitis virus in the United States, there are strong indications that the St. Louis virus finds a reservoir in nature in wild birds, and possibly in wild mammals.

A vaccine similar to those developed for equine encephalomyelitis has been prepared for St. Louis encephalitis; this has proved effective in protecting laboratory mice against the disease, but its efficacy in men or horses has not been determined.

There is at present no basis for judging how widespread the new virus may be. In cooperation with physicians and veterinarians, the U. S. Public Health Service is working on the problem. It is obvious that there are grave implications in the apparent spread in the United States within the last decade of three distinct, yet clinically similar viruses causing encephalitis in both men and horses, and all having a possible reservoir in nature which complicates immeasurably the problem of control.

* * * *

Unanswered Questions

Just how the infecting agent causes a specific disease, what changes occur, where these changes are initiated, the nature of the resulting products and their influence on the physical and chemical process underlying the normal cellular activity of the animal, are questions which must be answered before chemotherapy can be highly effective in relieving man of the many ills that now reduce his efficiency, limit his usefulness and endanger his life.—*M. L. Crossley, M.D.*

Left to Right: Harold W. Knirk, student; Dr. E. K. Sales; Dr. Wade Brinker (behind Dr. Sales); Benjamin R. Parkhurst, Clayton E. Kokx, Leo Levine, Joseph Zeldner, and Arthur L. Starkey, students. Messrs. Levine and Zeldner, students at the time this picture was taken, have since received their D.V.M. degree

THE illustrations on this page (the one above is a smaller reproduction of that appearing on the front cover) show Dr. E. K. Sales demonstrating the cat spaying operation to a group of students in the small animal clinic of the Division of Veterinary Science, Michigan State College. He is assisted by Dr. Wade Brinker, clinician.

In discussing the technic of the operation, Doctor Sales said that the site should be clipped close and washed thoroughly. He remarked that cats are usually more difficult to clip than dogs. For disinfection, 70% alcohol is used. The anesthetic should be administered quickly and the animal watched carefully meanwhile, since this is a danger point—the cat can die during the instant that one happens to turn one's head away. If this should occur, immediate artificial respiration may be of avail; but it is better to avoid the necessity for such a measure by close attention to the progress of the anesthesia.

The surgery, according to Doctor Sales, is very similar to that employed in the canine operation. The area is more likely to be congested than it is in dogs.

Uneventful recovery should follow a properly-performed operation. The use of healing powders containing phenol products should be avoided, since cats are highly susceptible to phenol.

Left to Right: Gabriel W. Tuder, student; Dr. E. K. Sales; Arthur L. Starkey and Clayton E. Kokx, students (behind Dr. Sales); Dr. Wade Brinker; Leo Levine and Joseph Zeldner, students

Messrs. Tuder, Levine and Zeldner were graduated from Michigan State College in June, 1941

Encephalomyelitis in 1941

At midseason it can be said that this has been a moderately bad year for equine infectious encephalomyelitis. Perhaps, even probably, the outbreak would have been very extensive but for the prophylactic use of chick vaccine. The effectiveness of this vaccine in preventing the disease was again amply demonstrated.

Not a great deal of pre-season vaccinating was done, but with few exceptions, when the disease appeared in a locality a majority of the horses and mules in that section were vaccinated promptly. How much loss from the disease was prevented in this way can be only surmised, but in the few localities where vaccination was not resorted to and in the more numerous instances where the vaccinating was improperly performed, the loss was the highest since 1938.

The disease appeared earliest this year in the southwest. Experience in Texas may be taken as typical of what occurred in June and July in that section and later in various parts of the midwest.

All of the Army horses were vaccinated early in June. Up until the first of August no cases of encephalomyelitis had developed among these animals. The experience at Ft. Bliss (near El Paso) is typical. At this Post 12,000 animals were vaccinated. They were given two injections. In each instance the whole number were injected on a Saturday forenoon and the animals rested until Monday morning, when they were put to work. An irreproachable technic was employed and no unfavorable sequels developed as a result of either injection, nor, as stated before, did any cases of the disease occur later.

Reports from eight veterinarians in the state who did a considerable amount of vaccinating are that no cases developed in vaccinated horses; a ninth reported considerable loss among vaccinated animals.

One county in Texas where encephalomyelitis appeared fairly early affords a comparison of the value of expert and inexpert use of the chick vaccine. Here the county agent organized the vaccinating, and he and his assistant and several volunteer assistants vaccinated more than 5000 horses. The one veterinarian in the county vaccinated 900 at approximately the same time. There was no instance of the development of the disease in a horse vaccinated by the veterinarian, but occurrences of the disease among the lay-vaccinated animals were described as "numerous." An explanation of this may lie in an observation of the technic of one of the volunteer workers. He was making the injections subcutaneously and when informed the vaccine should be deposited in the skin averred he had been told and shown to "shoot it under the skin." A member of the state live stock sanitary service after an investigation expressed the opinion that all the lay-vaccinated animals in that county had been vaccinated subcutaneously and that these vaccinations had not materially affected the incidence of the disease.

Incomplete reports indicate that the mortality rate is higher this year than last.

* * * *

Good Horse Sense

A national horse magazine shows good horse sense in the following editorial comment:

This month two horsemen asked us for advice which only a veterinarian should give. Please don't go about studying up some symptom that calls for the purchase of a medicine for your pet. Of course, you doubtless feel better after you have bought some bottle or can of medicine, but does the horse benefit by it? Time enough to buy medicine when it is prescribed by the doctor. . . . I know a lot of farmers who get the same medicine-giving fever. They ought to be compelled to take some of their own "conditioning powders." . . . The great need of horses is pure air and cleanliness with proper feeding, grooming and watering. When a horse is really sick, call a veterinarian.—*National Horseman.*

* * * *

Of course you must realize that horse sense is the result of stable thinking.

* * * *

Horses and cattle are six times and pigs three times as popular with mosquitos as is man, although he is more popular than chickens and cats.

The Largest Cavalry Post

Nearly 12,000 government animals are maintained at Ft. Bliss, the army post near El Paso, Texas. This number is greater than at any other station in the United States. It includes the mounts, artillery horses, and pack trains of the 1st Cavalry Division, the 56th Cavalry Brigade (Texas National Guard) and some remounts. Altogether there are approximately 30,000 troops at Ft. Bliss.

There are more veterinary officers on duty at Ft. Bliss than at any other Post, 51 in all. They belong in five categories: the Post Service Command, the 1st Cavalry Division, the 56th Cavalry Brigade, the 1st Veterinary Company (separate), the 16th Veterinary Evacuation Hospital, and the 30th Veterinary General Hospital. The last three organizations are Third Army installations.

The veterinary officers at Ft. Bliss include:

Station Complement

Col. Daniel B. Leininger, Station Veterinarian; Maj. Robert P. Kunnecke, C. O. Veterinary Station Detachment; Maj. Austin T. Getz, Station Forage Inspector; 1st Lt. Fred L. Molt, Hospital Clinic; Lt. Col. Paul C. Kucher and 1st Lt. John L. Cox, Specialists' School.

1st Cavalry Division

Maj. Harvey R. Ellis, Division Veterinarian; Capt. George W. Gillie, Assistant.

5th Cavalry.—Capt. John M. Broadwell, 1st Lt. John B. Reneau, Jr., and 1st Lt. Floyd B. Watts.

12th Cavalry.—Capt. Jack O. Whitehead, 1st Lt. Wendell L. Kanawyer, and 1st Lt. Carl H. Scholle.

7th Cavalry.—1st Lt. Horace R. Willard, 1st Lt. Benjamin F. Gearhart, and 1st Lt. Joe C. Turner.

8th Cavalry.—1st Lt. Charles W. Tate and 1st Lt. James R. Ketchersid.

61st Field Artillery BN.—Capt. Weldon M. Couch.

82nd Field Artillery BN.—1st Lt. John N. McCamish.

16th Quartermaster Squadron.—1st Lt. J. B. Couch.

Veterinary Troop.—1st Lt. Lee R. Chapman, 1st Lt. Joseph B. Adams, 1st Lt. Walter E. Cameron, and 1st Lt. Elbert L. Kelly.

SOME OF THE BUILDINGS AT THE 30TH VETERINARY GENERAL HOSPITAL, FORT BLISS

This view of buildings of the 30th Veterinary General Hospital is taken looking due north. The buildings shown include (left to right): the Recreation Building, the West Barracks, the East Barracks, the Administration Building, and the Mess Hall at the extreme right

56th Cavalry Brigade

112th Cavalry.—1st Lt. C. T. Luker and 1st Lt. V. L. Kothman.

124th Cavalry.—Maj. L. H. Baker, Maj. T. A. Ward, and 1st Lt. Carl Fink.

1st Veterinary Company (Separate)

Capt. Walter Smit, 1st Lt. Blakley T. Deal, 1st Lt. Harold K. Miller, and 1st Lt. Douglas F. Watson.

16th Veterinary Evacuation Hospital

Lt. Col. Charles C. Wright, Maj. Andrew J. Creely, Capt. Robert S. Norton, 1st Lt. Homer T. Martinez, and 1st Lt. Rodwin C. McCornack.

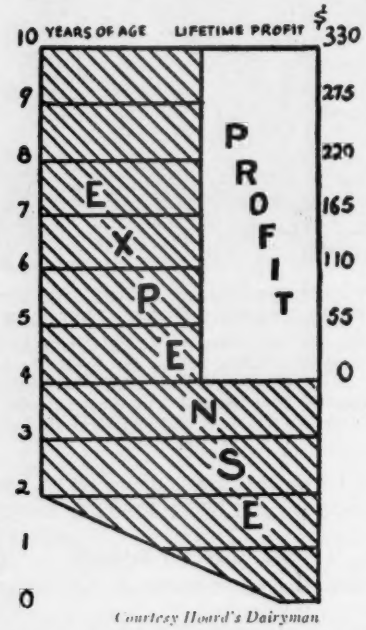
30th Veterinary General Hospital

Lt. Col. Delwin M. Campbell, Maj. Fred B. Green,* Capt. Tom Evans, Capt. Joseph F. Nieberding, 1st Lt. Louis B. Bate, 1st Lt. Homer B. Brown, 1st Lt. George C. Coburn, 1st Lt. John P. Denton, and 1st Lt. John A. Utterback, Jr.

* Major Green died suddenly on July 24 of coronary occlusion.

Good Care of Cows Profitable

According to Fraser,[1] of the Illinois Experiment Station, the life of an average dairy cow in this country is about six years. Since it takes about two years in milk before the expense of rearing her has been paid for, a cow is four years old before she begins to make any net profit. If she lives six years, this leaves only two profitable years for the farmer. This is shown in the diagram, which is taken from Fraser's article.



Courtesy Hoard's Dairyman

Total net profit at different ages made by a cow producing 320 pounds of fat a year under general farm conditions. The figures at the left indicate the age of the cow. The figures on the right show in dollars the total net profit the cow has made at different ages. Since it requires two years of production to pay for raising, net profit does not begin until the fourth year, and from this time on the net profit is $55 per year under conditions assumed in this illustration

As this author goes on to point out, if a dairyman, by good breeding, feeding and care, produces a herd which lives longer than six years, he will greatly increase his profit. If his cows live to be ten years old, they will have six years to earn a net profit, or three times as many profitable years as do the six-year-old cows. Stated in another way, the dairyman is obliged to milk and care for three six-year-old cows for four years, or a total of twelve milking years, to get only six years of profitable production from all three cows. In contrast, he cares for and milks one ten-year-old cow for eight years and gets six years of profitable production from her, which is the same number of profitable years obtained from three cows which live only six years. —*Vitamin D Digest.*

That is, with one-third the investment and two-thirds the labor he makes one-third more profit by good animal husbandry. Since disease is the principal cause of the elimination of dairy cows from the herd, the kind and amount of veterinary service has a direct, often a determining influence on the profit or loss of the dairyman.

[1] *Hoard's Dairyman*, Oct. 10, 1940.

500 Trichobezoars

The *National Provisioner* is authority for the statement that Mr. A. E. LeStourgeon, president of the Brooking's Packing Co., Tulsa, Okla., has more than 500 hair balls collected from bovine stomachs.

Some of Mr. LeStourgeon's experiences in collecting these aegagropile are interesting. He says: "Whenever I see a bunch of skinny, high-hipped cows I know the boys out in the plant will be bringing me in some more hair balls." And again: "Hair balls are found in all breeds of cattle and in both sexes; in young and old; in all ages and at all seasons. They are most common in middle-aged cows that have been heavy producers."

In this collection there are hair balls varying in size from one-half to 14 inches in diameter, in shape from that of an egg to that of a doorknob; and in weight from a fraction of an ounce to more than six pounds. "Their structure is laminated and they are almost invariably arranged about a small piece of metal or stone."

These hair balls were collected in a period of four years, during which 50,000 cattle were slaughtered, making the average one hair ball to 100 animals.

Hog Cholera, Swine Erysipelas and Enteritis from a Community Sale

A hog feeder near Estherville, Iowa, collected from various points of northern Iowa a herd of 150 feeder hogs. All had been vaccinated against hog cholera before they were acquired. No difficulty was experienced by the feeder until they had reached a weight of 175 to 200 pounds. At that time he purchased 50 pigs at a community sales barn in Estherville. They were vaccinated with serum and virus at the sales barn, and then placed immediately in the feeding lot with the larger hogs.

In about ten days, the larger hogs began to sicken and die—a circumstance emphasizing the fact that it is necessary to isolate swine for a period of three weeks after serum-virus treatment.

After 30-odd head died, Dr. H. L. McMillan of Estherville was called. He, in turn, called Dr. John S. Koen, Storm Lake (B. A. I. representative on hog cholera control for Western Iowa) for consultation. Finding three serious conditions—hog cholera, swine erysipelas and hemorrhagic dysentery—in the herd at the same time, a conference of neighboring veterinarians was suggested and those shown in the illustration gathered for a demonstration in charge of Doctor Koen. The whole afternoon was spent in study and conference. All pronounced the conference as very instructive and well worth while. Remedial measures were instituted for all three diseases present in the herd and the losses were stopped, but not until 30 more animals, making a total of 60, had succumbed.

AN INFORMAL IOWA VETERINARY CONFERENCE ON HOG CHOLERA, ENTERITIS AND SWINE ERYSIPELAS

Left to right, kneeling: Dr. Frank Place, Milford; a veterinary student from Milford, and Dr. D. M. Staunch, Lake Park. Standing: Drs. F. E. Wyland, Terril; R. W. Heise, Emmetsburg; H. L. McMillan, Estherville; H. C. Smith, Fort Dodge; L. F. Hoffmann, Estherville; B. E. Dappen, Graettinger; M. Donahoe, Milford; H. E. Pinkerton, Fort Dodge; and Olene Jacobson, Graettinger

Conferences and clinics such as this are particularly valuable because of the very human tendency, once a disease has been recognized, to center all attention on it and thus overlook a concurrent infection. In the presence of an unmistakable outbreak of hog cholera, the inclination to make every effort to bring it under immediate control is so strong that in not a few instances concomitant infections, such as existed in this case, have been overlooked until too late to save the herd.

Here there were three distinct diseases. Diagnosing one disease and allowing that to obscure the search for other diseases that might be present would have resulted in the loss of this herd, however skillfully the particular disease diagnosed might have been treated. Because of the tendency to search no further once a disease is definitely diagnosed, it happens too frequently that either hog cholera or swine erysipelas is overlooked, with disastrous results. The herd is lost, the farmer is impoverished and his confidence in veterinary service shaken, and the veterinarian's prestige lowered. Overlooking a concurrent infection is like delivering one of twins in a case of dystocia and leaving the other to be discovered by someone else, or perhaps delivered normally.

It is because a sequence of cause and result such as this can happen and has happened that conferences such as this one at Estherville are so valuable. Here it was indelibly impressed upon the minds of all who attended that no treatment for only one of the diseases would have been of any value whatever to this herd, and that the recognition and treatment of only one of the diseases would have been no better than to have failed to recognize any disease at all.

The situation is quite different from one in which there are complicating infections present along with hog cholera, such as suipestifer, pneumonia, hemorrhagic septicemia, necro-enteritis, etc. In such cases, combating the cholera is advantageous; although it does not complete the job, it does cut down the loss. Although the result is seldom satisfactory, it is not complete disaster as in the other case.

* * * *

Phenothiazine Poisoning in Swine

A group of pigs were treated with phenothiazine at 3:00 p. m. All pigs ate normally that evening, but in the morning, several were showing nervous symptoms and some were paralyzed. These pigs would remain down for a day or more and gradually recover. The death loss was very low. These pigs seemed to have an increased thirst and would drink if held up to the trough even while paralyzed.

Some pigs did not show toxic symptoms until two days after treatment. Temperatures were mostly subnormal to normal. There was no scours, and no inflammation of the intestinal tract. The dosage given these pigs was less than that indicated on the bottle. They all seem to be doing well now and the paralysis did not seem to have any bad effect on them after recovery.

These pigs were fed ground corn two parts, ground oats one part, with addition of oil meal and yeast. They showed no anemia.

C. L. LEKWA.

Bennett, Ia.

An Iowa herd treated with crystal violet hog cholera vaccine

Contributing Factors Causing Death in Sheep Infested with the Nodular Worm

By D. F. EVELETH,
Department of Bacteriology and Veterinary Science
and N. W. HILSTON
Department of Animal Industry
University of Arkansas, Fayetteville, Arkansas

THE nodular worm *Oesophagostomum columbianum* constitutes one of the most serious problems of sheep raising in certain sections of the southern part of the United States.

The life cycle of this parasite is direct. Briefly, the eggs are passed in the feces of the host, the larvae reaching the infective stage in about one week. After ingestion by the host, the larvae cast their sheaths and penetrate into the wall of the intestine, anywhere from the pylorus to the rectum. In lambs or in older sheep that have developed no resistance against the parasite, the larvae embed themselves in the mucosa, causing little reaction, and after five days the young worms return to the lumen of the gut and pass to the colon, where they grow adult. The first eggs are passed in the feces 41 days after infection.

Where the mucosa has developed a degree of resistance through previous infection, the larvae pass into the submucosa; here a marked inflammatory reaction takes place around each larva and it becomes encapsulated. The larvae may stay in these nodules for about three months; when the contents caseate and calcify, the parasite either dies or leaves the nodule to wander about between the muscle fibers, leaving behind it a narrow canal filled with material similar to that found in the nodules. Such larvae usually do not find their way back into the lumen, so that in such cases the intestinal wall may show numerous nodules and tracks while the colon contains few or no adult worms.

The serious pathological effects of the parasite—persistent diarrhea resulting in exhaustion and death; or intermittent diarrhea with progressive emaciation and weakness, ending in prostration and death—usually arise from the irritation of the intestinal mucosa caused by the young worms after their return to the lumen of the gut, and from the toxic substances which they secrete. The formation of nodules in the submucosa and the retention of the larvae in them therefore acts as a protective mechanism, and the nodules are usually considered of little pathological importance unless they occur in such large numbers that the resulting thickening and rigidity of the intestinal wall interferes with peristalsis; unless the larvae enter the blood

The immediate spectacular results obtained by the use of an efficient anthelmintic are likely to blind us to the fact that there is more to parasite control than killing the parasite. This article points out some of the hazards incident to nodular worm infestation in sheep in which the acute infestation has been controlled by medication. Although the nodules which remain in the intestine are usually of little clinical significance it is pointed out that they may become a source of trouble at lambing time, or if the animals eat feeds producing excessive amounts of gas in the intestinal tract.

* Research paper No. 697, journal series, University of Arkansas. Published with the approval of the Director of the Arkansas Agricultural Experiment Station.

or lymph vessels or the abdominal cavity and produce nodules in other organs, such as the lungs; or unless the larvae carry bacteria into the intestinal wall, giving rise to abscesses which may rupture into the peritoneal cavity and cause peritonitis.

Various control measures (pasture rotation and different types of anthelmintics) have been used for this parasite, with varying success. Phenothiazine has been reported as very effective in removing the worms from the intestinal tract, and certain other measures have proved more or less effective in reducing the incidence of infestation.

Such measures, however, although they decrease losses by preventing the development of acute infestations, have no effect on the nodules already present in the sheep, which persist throughout the life of the animal. Although, as mentioned above, a moderate number of nodules apparently does not affect the sheep adversely in most cases, the observations reported here indicate that certain contributing factors may operate to cause death losses in sheep which otherwise might show no ill effects.

■ One such observation was made during the 1939-40 season in a flock in which there was no opportunity for pasture rotation, but in which the incidence of nodular worm infestation was kept down by medication. During the season of green grass the animals were allowed access to a Bermuda grass pasture located on low, level ground with very poor drainage. When grass became scarce in the fall, the sheep were penned in small enclosures and hand fed. From April to December, the sheep were treated every 21 days with a mixture of copper sulphate and nicotine sulphate. Two lambs killed in October were found to harbor a few mature stomach worms and very few nodular worms.

When the flock came off pasture in the fall, the sheep were divided into two groups of 17 each. One group was fed alfalfa hay with a supplement of yellow corn. The other received various types of ensilage with supplements of yellow corn and cottonseed meal. Bonemeal and sodium chloride in protected boxes were available to both groups at all times.

Fig. 1. Nodules in the walls of the small intestine of a mature ewe

During the early winter there were four deaths in the alfalfa-fed group (a mortality of 24%), and one in the silage-fed group (a mortality of 6%).

All five sheep were examined post mortem. In none of them were adult nodular worms found in the intestine.

The silage-fed sheep, a yearling, had displayed a profound anorexia for several weeks and was extremely emaciated. On necropsy it was found to have abscesses in one lung.

All four of the alfalfa-fed sheep were in good flesh. All had shown a rapidly developing bloat prior to death. Necropsy findings in these four included extreme distention of the stomach and intestines; emphysematous processes in the abdominal cavity and in the muscles of the legs; and peritonitis accompanied by a fibrinous exudate in the entire peritoneal cavity, with soft, swollen kidneys and livers. In some cases external ruptures of the parasitic nodules were found. In a few cases the mesenteric

lymph nodes contained calcified areas. Some of the sheep showed severe pneumonia with pleuritis.

These findings strongly suggest a relationship between the feeding of alfalfa and the death of the sheep. In reconstructing the pathogenesis of the disease, it appears that the alfalfa hay produces excess gas in the gastrointestinal tracts of the sheep. This distention of the gut causes sufficient stretching of the walls of the parasitic nodules to produce a rupture, and the pressure of the gas inside the gut forces enough of the intestinal contents into the peritoneal cavity to cause severe peritonitis. In one of these sheep, bloat as the direct cause of death cannot be definitely ruled out; but in the other three, the lesions unmistakably pointed to peritonitis as the mortal factor.

Later (January 15, 1940), four more of the alfalfa-fed sheep were found bloated, but not in serious condition. The alfalfa was reduced in amount, and no further deaths occurred.

In reporting this observation, no attempt is made to discuss the relative merits of alfalfa and silage as a feed for sheep. However, it should be noted that the danger of bloat is always present whenever alfalfa is fed; and that this condition appears to be particularly dangerous for sheep infected with nodular worms.

■ During the lambing period of 1941 two additional deaths were observed. In these cases severe peritonitis followed lambing. One of the ewes was treated for metritis by a local practitioner, while the other received no treatment. In both cases the reproductive tracts appeared normal. Both of these ewes were found to have many nodules in the intestinal walls. Again, it appears most probable that mechanical pressure caused rupture of the nodules, with resulting peritonitis.

■ In Fig. 1 is shown a section of small intestine of a ewe, with many nodules present. This type of pathology may be in part due to infestation with nodular worms and in part to infection with *Mycobacterium paratuberculosis*. In this particular case the ewe had reacted to the intradermic johnin test, and acid-fast bacilli were demonstrated in the intestinal scrapings. The large nodules are due to the parasite and associated pus-forming organisms rather than to the paratuberculosis organism.

■ In summary, it may be said that while various control measures are definitely effective in reducing the losses due to nodular worms in sheep by removing the parasites from the intestinal tract and preventing reinfestation, the problem of control does not end there, except perhaps for succeeding generations. The observations presented above indicate that the remaining nodules may constitute a source of trouble at lambing time, or if the animals are fed feeds which produce excessive amounts of gas.

Equine Abortion and Diseases of Foals*

By WM. E. JENNINGS, Captain, V.C.
Quartermaster Depot, Front Royal, Virginia

Part of the Broodmare Band at Front Royal Remount Depot

MUCH credit for the progress made during the last decade in the solution of problems that frequently confront the horse breeder, should be given to those engaged in the breeding of light horses—the thoroughbred in particular. The popularity of racing has been largely instrumental in creating a greater demand for the thoroughbred, and this in turn has stimulated a greater interest in their breeding.

In a thoroughbred nursery a veterinarian has an excellent opportunity to study the many problems of breeding which are ever present. Here are collected from 10 to 300 brood mares of all ages in varying stages of health, which afford the veterinarian every opportunity to employ all his knowledge in meeting the challenges which such a set-up presents. Diseases, particularly abortions, often occur in epizootic form. In such a nursery, accurate records must be kept. These records reveal highly interesting and important facts, which often explain the occurrence of unexpected happenings. It is regrettable that at some of the larger nurseries, the records are both inadequate and inaccurate.

Approximately 700 stallions are kept in the stud of the Remount service of the United States Army. The majority of these are thoroughbreds. Each stallion is placed in charge of a suitable civilian agent who cares for him and breeds to him not more than 40 selected mares during one year. The agent is allowed to charge $10 for each mare that he breeds. These fees defray the expenses of feeding and caring for the stallion. The government has no lien upon the get of the stallions.

These remount stallions are purchased from breeders and trainers all over the country, and immediately sent to the nearest remount depot. There are three remount depots in the United States. All are maintained and manned by the War Department. They are located at Front Royal, Va.; Fort Robinson, Neb.; and Fort Reno, Okla. The remount depots are maintained primarily to receive, condition, classify and train newly purchased horses to be used by the mounted units of the army. The second function of these depots is to promote the horse breeding plan of the army, e.g., exercise supervision over the handling of the 700 government stallions. Each of the depots has a band of approximately 55 brood mares. These mares are maintained for three purposes: (1) to train suitable officers in some of the common problems associated with breeding that they may be qualified to advise the stallion agents on the proper procedures to follow; (2) to raise a few select horses for use in mounted service schools; and (3) to demonstrate the various types of horses produced from different crosses.

The foals from these mares are kept until

* Presented at the Conference for Veterinarians, School of Veterinary Medicine, University of Pennsylvania, Philadelphia, Pa., January 7, 1941.

June of their fourth year, when they are selected for the two mounted service schools —the Field Artillery School at Fort Sill, Oklahoma and the Cavalry School at Fort Riley, Kansas. A few of these selected four-year-olds are sold to army officers who have been granted authority by the War Department to purchase them for their private mounts.

The brood mare band at Front Royal, Virginia, has been in existence for many years. The records kept on this band are accurate and fairly complete. The records for the past five years on this band of approximately 55 mares have been examined, grouped and classified in order to set forth as clearly as possible some of the common problems which confront the veterinarian whose duty it is to advise on horse breeding. Two of the major problems are abortion and diseases of foals.

History of Equine Abortion

Williams[1] was perhaps the first to observe and report an outbreak of equine abortion in the United States; this occurred in Illinois in 1886. His observations were confined to a clinical and pathological study. If we may judge from his description of the outbreaks and the pathological lesions which he recorded, it is evident that he was dealing with what is now known as Salmonella abortion. In 1890, Smith and Kilborne,[2] working in Pennsylvania, isolated from the vagina of a mare that had aborted, a bacillus which was shown to belong to the paratyphoid group; their experimental inoculations, however, gave negative results. In 1893 the same authors reported the isolation and study of an organism belonging to the paratyphoid group that was unquestionably *Salmonella abortivoequina* and their conclusion was that this organism is the specific cause of abortion among mares. In 1893 Turner[3] reported on a bacillus which was capable of producing experimental abortion in mares. From 1890 to 1913, various workers in this and other countries reported on abortion in mares and the results of bacteriological studies. Most of the reports include work with a bacillus belonging to the paratyphoid group, although streptococci were occasionally encountered. Good at the University of Kentucky first isolated *Salmonella abortivoequina* in 1911 and from his reports, it is evident that he was able to isolate this organism in all outbreaks of equine abortion which he encountered. Good and Smith,[4] in 1916, seem to have been the first to definitely establish that so-called equine contagious abortion is due to a bacillus belonging to the paratyphoid group which they named *Bacillus abortivo-equinus*, now known as *Salmonella abortivoequina*. In addition to their work on the etiology of the disease they devised a method of diagnosis through the use of the agglutination test and the complement fixation test and a method of prevention by treatment with bacterin. From 1916 to the present, it has been possible, therefore, to diagnose outbreaks of equine abortion due to *Salmonella abortivoequina* and through vaccination to prevent serious outbreaks of the disease.

In 1922 Dimock *et al*[5] observed 11 abortions in a band of 20 mares that had been immunized against *Salmonella abortivoequina*. The agglutination test for *Salmonella abortivoequina* was negative, as were cultures of the afterbirth and uterine secretions. Since that time at least 12 outbreaks of abortion have been reported among mares which proved upon examination to be bacteriologically negative. Dimock *et al.* have shown, however, that the disease is transmissible by contact, by ingestion of material from the aborted fetus and afterbirth, and also by materials which have been passed through filters impervious to ordinary bacteria. Though some of their cases gave negative results, abortion was produced in sufficient numbers to indicate that the disease is infectious and that the infectious agent is a filterable virus.

Dimock and Edwards group abortion in mares under four headings:

1. Salmonella abortion.
2. Streptococcic abortion.

[1] Williams, W. L., 1939. *Diseases of the Genital Organs of Animals*, Second Ed.
[2] Smith, T. and Kilborne, 1893. Bull. 3, p. 53.
[3] Turner, 1893. *Am. Vet. Rev.*, Vol. 17.
[4] Good, E. S. and W. V. Smith, 1916. Kentucky Agr. Exp. Sta., Bull. 204.
[5] Dimock, W. W. and P. R. Edwards, 1926. The differential diagnosis of equine abortion, with special reference to a hitherto undescribed form of epizootic abortion of mares. *Cor. Vet.*, 16:3, pp. 231-241.

TABLE I. FRONT ROYAL BREEDING RECORD OF FOALING MARES BRED ON 9TH DAY

Year	No. bred on 9th day	Conceived at 9th day service	Aborted	Foals dead or diseased at birth	Heavy or retained placentae	Conceived at 30 day service	Conceived at 3rd heat	Conceived at 4th heat or later	Did not conceive
1936	28	11	3	4	7	11	1	1	4
1937	23	17	3	2	9	1	2	1	2
1938	33	12	5	0	8	8	5	1	7
1939	24	7	3	2	8	12	1	1	3
1940	2	1	0	0	0	1	0	0	0
Totals	110	48 (43.7%)	14 (12.8%)	8 (7.3%)	32 (29.1%)	33 (30.0%)	9 (8.2%)	4 (3.7%)	16 (14.6%)

TABLE II. FRONT ROYAL BREEDING RECORD OF FOALING MARES NOT BRED ON 9TH DAY

Year	No. bred after 9th day	Conceived	Aborted	Foals dead or diseased at birth	Heavy or retained placentae	Bred on 30th day after foaling	Conceived to 1 service*	Conceived to 2 services*	Conceived to 3 or more services*	Did not conceive
1936	5	5	1	0	3	4	4	1	0	0
1937	13	12	1	0	4	9	8	3	1	1
1938	12	11	1	1	7	9	8	2	1	1
1939	15	13	0	0	3	8	10	2	1	2
1940	36	34	0	0	3	29	24	6	3	2
Totals	81 (42.4%)	75 (92.6%)	3 (3.7%)	1 1.3%)	20 (24.7%)	59 (73.6%)	54 (67.3%)	14 (17.3%)	6 (7.4%)	6 (7.4%)

*Double services in one heat not considered.

3. Virus or epizootic abortion.

4. Abortion due to miscellaneous causes. These make convenient subdivisions for discussion of the subject.

Salmonella abortion (Equine contagious abortion)

This is a specific infectious disease of mares due to *Salmonella abortivoequina* and is of an acute rather than of a chronic nature. All available evidence points to the fact that the organisms enter the body by ingestion, the period of incubation being from 14 to 28 days. There is no reliable evidence that the stallion is a spreader of this infection. The organism usually disappears from the uterus of the mare within 30 days following abortion, and barring the development of inflammatory processes due to the entrance of other organisms, the genital tract returns to normal. In a majority of cases the aborting mare produces a normal foal the following year. The diagnosis of Salmonella abortion is to be confirmed by the isolation of the organism from the aborted fetus, from the afterbirth, or from the uterine secretion. The disease may also be diagnosed through the use of the complement fixation test. Most cases of Salmonella abortion have been observed to occur in the latter half of the gestation period. The disease may be prevented and outbreaks put under control by vaccination with a bacterin made from *Salmonella abortivoequina*. It is the usual procedure to vaccinate each mare twice during gestation, the first series of injections being given during the fourth and the second during the ninth month of pregnancy.

Streptococcic Abortion

The portal of entrance of this infection is the genital tract. It is extremely unlikely that infection ever occurs through other channels. The streptococcus is either in the uterus of the mare before she is bred or is introduced at the time of service. The diagnosis is made on the basis of isolation of streptococci from the fetus. The afterbirth is usually found to be badly diseased; the mare usually develops metritis and cervicitis, returning to normal only after treatment.

During the 1939 breeding season at this depot 39 foaling mares were bred. Twenty-four (61%) were bred on the ninth day after foaling and only seven (29%) of this group conceived to that service. Of the seven that conceived to the ninth day service, three aborted prior to the 90th day of pregnancy, and in each case the mare was found to be infected genitally with streptococci. These were the only abortions occurring during the 1939 breeding season. It is

my opinion, supported by the records at this depot, that the number of streptococcic abortions can be materially reduced if one carefully reviews each mare's previous breeding and foaling history and notes all the "danger signals," such as a placenta weighing over 14 pounds or retained more than three hours; abnormal discharge in the puerperium; or a foal crooked, weak or diseased at birth, or dying shortly thereafter.

A comparison of Tables I and II reveals the following:

1. Of 191 foaling mares bred during the five-year period (1936-1940, inclusive), 110 were bred on the ninth day after foaling and 81 were not bred on the ninth day.
2. Of the 110 mares, only 43.7% conceived to the ninth day breeding.
3. Of the 81 mares not bred on the ninth day, 67.3% conceived to one service.
4. The abortion rate in mares bred on the ninth day (including those bred again subsequently) was 12.8%—four times as high as that in mares not bred on the ninth day.

Table III shows that there were 261 conceptions and 20 abortions during this five year period. In other words, 7.7% of the mares that conceived aborted. Streptococci were isolated either from the mare or from the fetus in 15 of the 20 cases of abortion. Dimock and Edwards state that approximately 20% of all abortions diagnosed by them are due to streptococcic infection. With us the rate due to this infection was 75%. This difference is explained by the fact that most streptococcic abortions occur early in pregnancy, usually prior to the fourth or fifth month of pregnancy. It is the policy at this depot to diagnose pregnancy on the 43rd day after the last service through the use of the rectal examination and the rat test. All mares are rechecked for pregnancy by rectal examination on the 90th day of pregnancy. In this interval (43rd to 90th day) we find the greater percentage of abortions occurring. The cases referred to Dimock and his associates for diagnosis were generally abortions occurring during the latter half of pregnancy; early abortions are usually unnoticed by the average attendant unless the mare fails to expel the afterbirth at once and recover promptly.

By observing the following rules, the number of streptococcic abortions can be reduced to a very low percentage:

1. Breed foaling mares only when the genital tract has returned to normal. Give a mare foaling abnormally in any respect plenty of time to return to the normal state.
2. Culture frequently and suture the vulvae of all mares which are infected or aspirating air into the vagina (wind-sucking).
3. Mate only healthy mares to healthy stallions and be scrupulously clean at the time of breeding; in other words, practice breeding hygiene in its every detail. The infection is ever present in the filth of the external genitals of both stallion and mare. Occasionally a stallion harbors this streptococcic infection in the genital tract and infects mares at the time of service in spite of scrupulous cleanliness. At this depot, we periodically check the semen of all stallions for the presence of infection.
4. Keep the brood mares healthy and in good flesh and feed a ration of hay and grain that contains all the essential elements of nutrition.

Quoting from a recent edition of the *Proceedings of the Kansas State College Veterinary Seminar*, it was the consensus of the meeting: "That 36.5% of barren mares are genitally infected on bacteriological examination. Of these, 66% are due to *Streptococcus genitalium*, 11% are due to *Encapsulatous genitalium* and 23% are due to miscellaneous infections. That the stallion is a passive carrier of *Encapsulatus genitalium*, and he does not remain perma-

TABLE III. FRONT ROYAL BREEDING RESULTS

Year	No. mares bred	Conceived No.	Conceived %	Barren No.	Barren %	Aborted No.	Aborted %	No. foals alive at birth	Living foal percentage*
1936	53	47	88.7%	6	11.3%	6	12.8%	34	64.2%
1937	66	59	89.4%	7	10.6%	5	8.5%	52	78.8%
1938	67	54	80.6%	13	19.4%	6	11.2%	48	71.7%
1939	59	50	84.8%	9	15.2%	3	6.0%	44	74.6%
1940	54	51	94.8%	3	5.2%	0	0	46	85.2%
Totals	299	261	87.3%	38	12.7%	20	7.7%	224	74.9%

*Number of foals alive at birth divided by number of mares bred.

nently infected. That *Encapsulatus genitalium* is a serious infection, which may cause permanent sterility, and that it may be spread by artificial insemination and dirty instruments. That many infections in mares are contracted at the time of foaling because the genital tract is open and the resistance of the mucous membrane is very low. That the custom of breeding on the ninth day after parturition is a dangerous one because of the infections that are likely to be present, and therefore, it should be discouraged. It is better to wait until the 27th day after parturition, or even later, before breeding. That if a mare is found to have a genital infection, she should be properly treated and should have sexual rest for from six months to a year."

Epizootic or Virus Abortion

Outbreaks of what has been tentatively designated as epizootic or virus abortion often assume serious proportions. In five of the first outbreaks of this disease observed by Dimock[5] and his associates, 76 of 129 mares aborted. Virus abortion in mares presents a distinct clinical picture. The disease usually occurs as an epizootic. The aborted fetuses are almost invariably negative when cultured. Occasionally a bacterial infection is present in addition to the virus. A majority of the fetuses reveal a characteristic pathological picture peculiar to this type of abortion. The disease is highly contagious and, while not all mares in a group abort, a sufficient number are affected to indicate that the disease is infectious.

Dimock and Edwards summarize the characteristic features of virus abortion in mares as follows:

1. The disease usually occurs in epizootic form.
2. The mares expel the fetuses without showing indications of approaching abortion.
3. The fetal membranes are rarely retained.
4. The mares suffer no apparent physical reaction.
5. The genital tract returns to normal quite as promptly as it does following a normal parturition. Mares which have aborted may be bred the same season and usually produce a normal foal the following year.
6. The gross pathology in aborted fetuses is rather uniform and consists of lesions not observed thus far in abortion due to other causes. The lesions observed on gross examination are: (a) Small, multiple, grayish white areas of degeneration in the liver; (b) hemorrhages on the heart, spleen and lungs, and congestion of the colic lymph glands; (c) an excessive amount of fluid in the thoracic cavity. A single fetus may show all of these changes, or only one or two of them may be observed. Occasionally, a serous fluid is present in the peritoneal cavity. In some cases, the amnion is considerably thickened and edematous.
7. All aborted fetuses are bacteriologically negative, except that occasionally streptococci are isolated. *Shigella equirulis* may be encountered in foals which are born near term and live for a short time. Since these two organisms are the most common cause of prenatal infections in the newborn foal, they are assumed not to be related to the disease.
8. The blood of the mares is negative to complement fixation tests for *Salmonella abortivoequina* infection.
9. Mares immunized with *Salmonella abortivoequina* bacterin are not protected against virus abortion.
10. Susceptible mares abort following natural exposure or experimental inoculation with raw or filtered material from aborted fetuses.
11. Convalescent and hyperimmune sera seem to furnish some protection when used for immunization.
12. Further evidence that this type of abortion is of virus origin is furnished by the occurrence of intranuclear inclusion bodies thus far observed most strikingly in sections from the liver and lungs.

Abortion Due to Miscellaneous Causes

Under this heading are included all cases of abortion that cannot be definitely classified as Salmonella, streptococcic, or virus abortion, such as those due to nutritional disturbances, to functional disturbances of the ovaries, and probably in some cases to an unbalanced condition of the whole endocrine system. Also included under this heading are twin pregnancies, accidents and injury, twisted cords, defective development or malnutrition of the fetus, noninfectious pathological lesions in the uterus of the mare, and occasionally such bacteria as staphylococci, non-hemolytic streptococci, *E. coli*, etc. During the past seven years in the Front Royal brood mare band of approximately 55 mares, we have had six sets of twins. Four sets were aborted (1934, 1935 and 1938); one set was foaled dead at term (1940) and the remaining set

(1938) was viable at birth, but the larger twin died on the fifth day thereafter.

Table IV, based on data published by Dimock and Edwards, shows a comparison

TABLE IV. RESULTS OF BACTERIOLOGICAL EXAMINATION OF 386 ABORTED FETUSES AND 273 DEAD FOALS

	Aborted Fetuses	Dead Foals (up to 8 months of age)
Negative	230 (60%)	53 (19.4%)
Twin	25 (6.5%)	——
Streptococci	96 (24.8%)	65 (23.8%)
S. abortivoequina	22 (5.7%)	6 (2.2%)
Staphylococci	6 (1.5%)	——
E. coli	4 (1.0%)	13 (4.8%)
S. equirulis	2 (0.5%)	110 (40.3%)
Corynebacterium equi	——	5 (1.9%)
Miscellaneous	——	11 (4.0%)
Injuries, dystocia	——	10 (3.7%)
Totals	385	273

*Data assembled from article, "Infections of fetuses and foals," by W. W. Dimock and P. R. Edwards, 1933, *J.A.V.M.A.* 83:5, pp. 718-726.

of the infections isolated from 386 aborted fetuses and from 273 foals dead at birth or dying before eight months of age, and the percentage of each group showing each infection. It will be noted that of 386 aborted fetuses subjected to a detailed bacteriological examination, 230 (60%) were negative. Twin abortions accounted for 25 (6.5%), all of them negative. From 96 (24.8%) streptococci were isolated. From 22 (5.7%) Salmonella abortivoequina was isolated. From 6 (1.5%) staphylococci were isolated. From 4 (1.0%) *Escherichia coli* was recovered and from 2 (0.5%) *Shigella equirulis* was isolated.

Controlling Abortion

To control abortion in any band of brood mares, there are four important considerations:

1. All the pregnant mares should be vaccinated each year against Salmonella abortion in both the fourth and ninth months of pregnancy.

2. To control and prevent streptococcic abortion, mate only healthy mares to healthy stallions and observe scrupulous cleanliness at the time of service and examinations.

3. Where it can be arranged, the brood mares should be kept in small groups so as to minimize the possibility of the spread of epizootic abortion and other infectious diseases.

4. Keep the brood mares healthy and in good flesh and feed a ration of hay and grain that contains all the essential elements of nutrition.

Diseases of Foals

Pyosepticemia (joint-ill) of the newborn foal, about which so much has been written during the last half century, still remains not only the most frequent disease affecting foals, but also the most serious and certainly the most unsatisfactory to treat. The losses from joint-ill in horse breeding areas, while not so extensive as a generation ago, are still sufficiently great to warrant a deep interest in this disease, especially with regard to its prevention. As a result of numerous investigations and data obtained from many different parts of the world, certain facts have emerged which have had an important bearing on our modern conception of the disease known as omphalophlebitis, navel infection, navel-ill, joint-ill, pyemic infection of newborn foals, etc. Most authorities agree that joint-ill may be either a septicemia or a focal infection; a prenatal or a postnatal infection; and further that it may be caused by any one of several organisms. It is most important to recognize that most of the cases of joint-ill in very young foals are serious septicemias. Too often, attention is focused on the swollen joints as if they were the most important aspect of the disease. Often the farmer does not understand why the foal should die when the only trouble was a swollen joint. A much better name for these cases is pyosepticemia, which puts the emphasis in the right place. The evidence for this contention comes from two main sources, viz., the post-mortem findings and the results of bacteriological examinations, which show *S. equirulis* and *E. coli* to be the organisms most commonly responsible for these acute septicemic conditions.

In groups of animals maintained for breeding, it has been observed that there is a close correlation in the occurrence of delayed conception, sterility, abortion, still births, and diseases of the newborn. With particular reference to horses, it has been demonstrated that infections of the genital tract of mares and stallions, together with faulty practices in breeding hygiene, have a direct relation both to many cases of abortion and to diseases of the newborn. The control of genital infections in mares

(through curtailment of the practice of breeding on the ninth day after foaling and proper treatment of infected mares) and

Some of the buildings in the veterinary hospital area at Front Royal

sanitary precautions at the time of service will help materially to reduce the prevalence of these conditions. There are some cases of abortion and some diseases of foals that are directly the result of bacteria existing in the genital tract of the mare before conception, or introduced there at the time of service.

Streptococcic infection, *Shigella equirulis* (*Bacterium viscosum equi*) infection and *Salmonella abortivoequina* infection, all occurring in the newborn, are often ante partum in origin. Streptococcic infection, as a prenatal infection of foals, is, as far as known, the result of an infection already existing in or introduced at the time of service into the genital tract of the mare. The other two, as prenatal infections of foals, are, as far as known, the result of intrauterine infection established following conception. All these may occur also as postnatal infections, although probably less frequently than is generally supposed. A further point that must be recognized is that the various abortions and diseases of the newborn are as distinct etiologically as are the various infections and diseases of the adult animal. Unitil this fact is understood and methods of prevention are based on it, little or no progress will be made in dealing with them.

In diseases of the newborn, symptoms peculiar to each type of infection are in most cases distinct, and pathological lesions produced are usually pathognomonic. However, they are not sufficiently characteristic in all cases and under all conditions to warrant a diagnosis without resort to a bacteriological examination. It must be remembered, however, that in only a small percentage of cases of diseases of the newborn is it possible to make a laboratory examination. Thus, the clinician in most cases must depend upon his own observation and experience in classifying these diseases. It is for this reason that attention is called to the fact that the history, symptoms, and lesions of foals sick from the different types of infection often present a syndrome sufficiently distinct and characteristic to be of diagnostic value. At this depot it is a routine procedure to culture every aborted fetus and every foal dead at birth, or dying within the following six months. This, we believe, can be accomplished by any practicing veterinarian if a little equipment is provided for the purpose.

Referring again to Table IV: this table shows a comparison of the infections existing in aborted fetuses and in dead foals varying in age from the newborn to those eight months of age. Dimock and Edwards[6] state that a post-mortem and detailed bacteriological examination was made on these 273 foals. As a routine procedure culture tubes were inoculated with material from all the internal organs and from the joint cavities of the legs. Of all the foals examined, 210 (77%) showed evidence of infection. These infections of foals will be considered in the order of frequency of occurrence.

Shigella Equirulis Infection in Foals

Shigella equirulis was the organism most commonly observed, being obtained in pure culture from 110 (40.3%) of the 273. As stated heretofore, infection with this organism is usually ante partum. Definite knowledge of the method of infection is yet to be obtained. Dimock states that in a majority (60%) of foals that died of this infection death occurred on the first, second or third day following birth. Practically all

[6] Dimock, W. W. and P. R. Edwards, 1932. Infections of fetuses and foals, Kentucky Agr. Exp. Sta., Bull. No. 333.

were visibly sick at birth. Many were so weak that they were unable to stand alone; others could barely stand; and still others were able to stand and walk but were markedly sick, dull and listless. Some were not noticeably weak but showed symptoms of a nervous disorder, continually walking around the stall and refusing to nurse. Thirty-six per cent of the foals exhibited no gross pathological changes. In some, however, an acute enteritis was apparent and occasionally peritonitis was observed. An acute nephritis was present; more rarely, a purulent embolic nephritis involving the cortex of the kidney. The joints of the foals which died during the first day were only rarely visibly affected, although in many instances the organism was present in the joint cavity. In foals that died at two or three days of age the lesions observed at post-mortem examination were more marked. These cases often exhibited a purulent nephritis, small abscesses of varying sizes from pin point to 5mm in diameter being scattered throughout the cortex of the kidneys. In older foals or foals sick for a longer period of time, the joints of the legs were more often affected. The joint lesions varied from a slight increase in synovial fluid and a congestion of the joint capsule to a purulent arthritis involving the joint cavity and tendon sheaths, with a great accumulation of fluid and extreme swelling. As a rule the more severe cases of arthritis were seen only in foals which had been ill several days. The hock, hip and stifle joints were more often involved than other joints of the legs. A few foals showed an extreme purulent pleuropneumonia. The disease in older foals was usually of a fulminating type, a hitherto apparently normal foal suddenly becoming prostrated and showing an extremely high temperature and a greatly increased pulse rate. Death usually occurred in a few hours, but in exceptional cases the animal lived for a week or longer. The pathological changes encountered at post-mortem examination, as in the younger foals, depended to a great extent upon the length of the illness. Though most authorities agree that a high percentage of cases due to infection with this organism are contracted ante partum, in only a very small percentage was Dimock able to recover the organism from the uteri of mares having diseased foals.

A good type army remount stallion

Streptococcic Infection in Foals

This infection accounted for the loss of the second largest group of foals in Table IV, streptococci being isolated from 65 (23.8%) of the 273 foals examined. Schofield[7] states that this type of infection is frequently seen in older foals, causing slight constitutional symptoms from which the chances of recovery are fairly good. He further states that it causes a transient bacteremia, later becoming localized in one or more joints. Dimock's records show that about 33% of all foals, dying as a result of this infection, die within the first three days after birth. This infection is both prenatal and postnatal in origin. The majority of streptococcic infections that cause death within seven days aftre foaling, are of intrauterine origin. Almost invariably those dying within seven days after birth showed symptoms of illness at or shortly after birth. Where fetal membranes from such cases were available, examination revealed gross evidence of a diseased condition. Dimock states that in cases of abortion due to streptococci and cases of streptococcic infection of the newborn, the mares have shown no clinical evidence of abnormality following parturition the year before, and were bred on the first subsequent heat period and conceived.

[7] Schofield, F. W., 1940. Joint-Ill (pyosepticemia) in foals. *Vet. Bull. Lederle* 9:5, pp. 127-130.

Table No. V shows the results of bacteriological examination of mares after foaling, by Dimock and Edwards.* The genital tracts

TABLE V. RESULTS OF BACTERIOLOGICAL EXAMINATION OF 220 MARES AFTER NORMAL FOALING OF HEALTHY FOALS*

Days	Negative	Strepto-coccus	*E. coli*	Miscel-laneous	Total
1	3	10		1	14
2	6	8	3		17
3	6	20	1	1	28
4	13	18	2		33
5	9	8	1		18
6	4	7			11
7	11	9		1	21
8	7	7			14
9	4	2		1	7
over 9	21	35		1	57
Total	84	124	7	5	220

*From Kentucky Agr. Exp. Sta. Bull. No. 333, Infections of Fetuses and Foals, by W. W. Dimock and P. R. Edwards, 1932.

of 220 foaling mares were cultured. Of these mares, 124 (56%) showed the presence of streptococci, 40.1% within nine days after foaling; 84 (38.2%) were negative; 7 (3.2%) showed *E coli;* and 5 (2.8%) showed miscellaneous infection. It has been demonstrated that the genital tract of a mare that has given birth to a normal foal is quickly invaded by streptococci. Dystocia, conditions which predispose to delayed parturition, major and minor injuries to the genital tract during delivery and aspiration of air into the vagina, etc., are factors of importance in increasing the susceptibility of the mare to streptococcic infection. The primary effect of the streptococci in breeding diseases is to produce metritis, which results in sterility. When a mare infected with these organisms conceives, the result is usually abortion, diseased membranes, or a diseased foal. This organism is either present in the uterus at the time of breeding or is introduced at the time of service, from streptococci present on the external genitals of the mare or stallion. Occasionally it may come directly from the semen of the stallion, if he is suffering from streptococcic infection of the reproductive glands.

The symptoms and pathological changes observed in foals that died from streptococcic infection vary with the age of the foal and length of illness. In foals born dead the changes most often observed are petechial hemorrhages on the serous surfaces, particularly the pleura and epicardium. Peritonitis is present in some foals, and occasionally there are circumscribed areas of congestion and hemorrhage surrounding the umbilicus. In foals sick at birth and dying within 24 to 48 hours, the most prominent symptoms are extreme weakness and prostration. In foals that live several days and that are not visibly sick at birth, the first symptom to become apparent is usually a disturbance of the digestive tract — diarrhea or constipation followed by diarrhea. Some foals die within a very short time and in these the only lesions are those of a generalized septicemia. Those, however, which are sick for some days before death occurs show more marked pathological changes which involve the internal organs and joint cavities.

The Negative Group

Fifty-three (19.4%) of all foals in Table IV proved to be negative when cultured; 70% of these were born dead or died during the first day. Some of these deaths were known to be due to dystocia. In other cases there was a history of difficult or delayed parturition. It is easily possible that some of these deaths were due to streptococcic infections, though it was impossible to isolate the organism. Negative foals that died at two or more days of age were found to have abnormalities of internal organs, particularly persistence of the ductus arteriosus, the foramen ovale, and anomalous imperforations of large and small intestines. Intussusceptions, rupture of the intestine, colitis, etc., were also causes of death in the negative group.

E. Coli Infection in Foals

Thirteen (4.8%) of the group in Table IV showed this infection. It occurred in very young foals, the animal rarely being more than 48 to 72 hours old at death. Most of these were visibly ill at birth. Such foals are often highly excitable, carry a high temperature, and refuse to nurse. Postmortem examination shows a generalized septicemia, peritonitis, and often a severe enteritis. In many cases the joints are involved and the synovial fluid contains purulent flocculi.

Salmonella Abortivoequina Infection in Foals

Six (2.2%) of the group in Table IV showed this infection. Seymour[8] reports an outbreak during the 1934 foaling season at Fort Robinson, Nebraska, where an outbreak of equine infectious abortion had occurred late in 1933 and early in 1934. He reports 16 cases of this type of infection in the foals; 11 died or were destroyed and five recovered. The placentae of the infected foals showed no gross pathological changes. The dams of all sixteen had received at least one or two series of infectious abortion bacterin during the gestation period. It is interesting to note that of the 16 mares having the foals which had contracted this infection, 15 were bred again during the 1934 breeding season. Of these 15, 12 conceived and foaled strong healthy foals in the spring of 1935. The other three mares were barren. Seymour concludes that:

1. On farms where infectious abortion has been present recently pyosepticemia of foals is prone to occur even where the most rigid sanitary precautions are observed. It is due in part to prenatal infection and perhaps in larger part to postnatal infection with *Salmonella abortivoequina.*
2. The symptoms and pathological changes noted on necropsy closely resemble many of the other types of infections of foals.
3. It is impossible to make an accurate diagnosis based on gross pathological lesions.
4. The treatment of infected foals is generally ineffective though in some cases life can be prolonged.

Corynebacterium Equi Infection in Foals

Five (1.9%) of the group in Table IV showed this infection. Dimock and Edwards[9] report that this infection causes a bronchopneumonia. Primary pneumonia of foals is a rather unusual condition. Most pneumonias of foals are a complication of joint-ill or navel-ill, Streptococcus and *Shigella equirulis* being the organisms most frequently found in cases of this type. *Corynebacterium equi* was first isolated by Magnusson in Sweden. This organism causes a purulent pneumonia. The course of the disease varies from six to 14 days. Magnusson reports a fatality of 80%. At this depot in July, 1938, a two-months-old foal died of pneumonia. From this individual a pure culture of *Corynebacterium equi* was isolated. From a careful search of the records, I have been unable to find any other appearance of this infection at this station.

TABLE VI. FOALS DEAD AT BIRTH OR WITHIN 30 DAYS POST PARTUM AT FRONT ROYAL

Cause of Death	1936	1937	1938	1939	1940
Twins			1 (1 lived)		2
E. coli					1
Icterus neonatorum			1		
Internal hemorrhage (from injury)			1		
Toxemia			1		
Dystocia		3			
Ruptured Stomach (from injury)		1			
Pyosepticemia	1	1			
TOTAL	1	5	4	0	3

Table VI shows the deaths of foals by year and by cause during the past five years at this depot (1936 to 1940, inclusive).

Treatment

In the treatment of diseases of foals one must constantly keep in mind the curative value of the dam's blood. Here are concentrated many substances which will help materially to overcome the effects produced by the various organisms in the young animals. Most of the diseases of young foals are manifested as generalized septicemias. The mortality rate is high regardless of the treatment. Some advocate the use of joint-ill bacterins, etc., in the immunization of the pregnant mare during pregnancy and the immunization of the foal with injections of the bacterin as soon after birth as possible. Others have obtained some beneficial results from the immunization of the foal only. Other authorities consider this immunization to be of little, if any, value. This latter group places particular emphasis on prevention, i.e. practicing good breeding hygiene in its every detail.

Prevention

Absolute cleanliness should be practiced at the time of breeding and of examinations. The external genitals of both mare and stallion should be cleansed thoroughly with soap and water prior to service.

[8] Seymour, R. T., 1936. Pyosepticemia of foals due to *Bacillus abortivoequinus, Vet. Bull.,* U. S. Army, 30:3, pp. 277-283.

[9] Dimock, W. W. and P. R. Edwards, 1931. *Corynebacterium equi* in pneumonia in foals. *J.A.V.M.A.,* 79:6, pp. 809-813.

The data in Tables I and II show that at this depot during the past five years the rate of foals dead or diseased at birth was 7.3% in mares bred on the ninth day after foaling. This is nearly four times greater than the rate in mares not bred on the ninth day. In view of this fact alone, it would seem that great care should be exercised in the selection of mares to be bred on the ninth day and, generally, that ninth day breeding should be practiced as infrequently as possible. In any method or scheme of prevention, each individual mare's foaling and breeding history must be studied carefully before making any decisions in regard to future breeding, care, management, and treatment. There are some mares which constantly or intermittently show "danger signals" such as heavy placenta (over 14 pounds), placenta retained longer than normal (more than three hours), foals weak, dead or diseased at birth, or dying shortly after birth, abnormal discharges in the puerperium, etc.

A young thoroughbred broodmare raised at the Front Royal Remount Depot and her first foal, a great-granddaughter of Man O' War

The breeding and foaling history of two of the mares which have been showing "danger signals" on and off during the past five years or longer will be summarized briefly. Both mares are thoroughbreds of excellent type and very valuable to our brood mare band. Runfire, a ten-year-old mare, produced a normal foal as a maiden in 1934. In March, 1935, she had a normal foal weighing 120 pounds and carried 332 days. The afterbirth of this foal weighed 24 pounds. She was in heat and bred March 22 (the ninth day), and was bred again May 10, June 15, September 26 and 28, conceiving to the last breeding. She foaled August 9, 1936, a small (95 pound) foal which she had carried but 318 days. It was crooked and weak at birth and died four days later from pyosepticemia. This illustrates that this mare had not returned to normal and although conception did occur, the result was disastrous. Further, it illustrates that a mare foaling normally but having a heavy placenta (24 pounds) usually will not conceive to breeding on the ninth day following parturition. Breeding in such cases merely excites inflammation already present and delays involution of the uterus. This mare was not bred in 1936. Some difficulty was experienced in bringing about conception in 1937. Her vulva was sutured first in 1938 immediately after foaling, and has been kept sutured since that time. In 1938 she was bred on the ninth day and conceived, foaling normally in 1939, although the placenta weighed 17 lbs. and that portion in the non-pregnant horn was very edematous. She was bred on the 35th day

after foaling. In 1940 she foaled normally and was bred on the 30th day after foaling and in two subsequent heats, being double covered in the third heat, when conception occurred. Though she appeared normal in every respect prior to the 30th day breeding, there was evidently some good reason for her not conceiving until the fourth heat period. This mare foaled normally in 1941 though the placenta weighed 15½ lbs.

Indian Maid is a 19-year-old mare. We first attempted to breed her in 1935, without success. She conceived to the third service in 1936 and foaled a crooked foal April 10, 1937. She was bred in 1937 on the ninth day and conceived, foaling a crooked foal March 29, 1938. The placenta was retained for four and one-half hours. She was in heat on the eighth day and out of heat on the tenth day; back in heat on the 13th day and out on the 15th day. Such irregular manifestations of heat indicated the presence of some inflammation. Coming in heat on the 30th day, she was bred on the 31st day and was out of heat on the 35th day. She conceived from this service, and foaled April 10, 1939, a very crooked foal. The placenta weighed 17½ pounds. The ninth day heat lasted five days. She was bred on the 32nd day after foaling and conceived. In 1940 she foaled on April 26 a normal foal with normal weight and retention of membranes. During the puerperal period she had an excessive amount of discharge and on the tenth day after foaling her temperature was 105.0° F. She responded very well to treatment for pyometra. The vulva was clamped shut with large metal clips immediatly after the first treatment on May 6. The clamps were removed daily and the uterus treated with antiseptics. (In such cases the author has had very favorable results from clamping the lips of the vulva together until involution of the uterus occurs. Mares that abort after the fourth or fifth month of pregnancy are clamped in a similar manner. This prevents the sudden ingress of a large amount of air carrying with it much filth into an organ already inflamed and in a favorable condition for the multiplication of bacteria. Clamping the vulva seems to hasten involution of the uterus which has been relieved of its normal contents prematurely.) The vulva of Indian Maid was sutured on May 11—five days after the sudden rise of temperature. She came in heat on her 28th day and was cultured at that time. Due to the fact that this mare would be in heat but once during the remainder of the breeding season, which was to close on June 30, it was decided not to take a chance on the infection disappearing in that short period. It is always a good policy to let an infected mare, recently sutured to overcome infection, go through several heats before attempting to reculture. The longer the period of rest after infection has existed, the better. Some authorities say that at least six months should be allowed for the uterus to return to its normal state after a serious infection.

In Table III is shown by year the final result of breeding—the living foal percentage. This is determined by dividing the number of foals alive at birth by the number of mares bred. The percentage of conceptions over the five-year period averaged 87.3%; the living foal percentage for the same period averaged 74.9%. All abortions, foals dead at birth, mares that die during pregnancy from any cause or die during delivery, etc., help to lower the living foal percentage. The abortion rate for the five-year period was 7.7%, the highest rate occurring in 1936 and the second highest rate in 1938.

Conclusions

To lower the abortion rate and increase the number of live, healthy foals—in brief, to maintain a high standard of breeding efficiency over a period of years one should take cognizance of the following factors:

1. Ninth day breeding should be practiced as *infrequently* as possible. No mare should be bred on the ninth day if any of the following conditions has occurred: (a) Placenta weighed over 14 pounds. (b) Placenta was retained more than three hours. (c) Foal was weak, crooked or dead at birth or died shortly thereafter. (d) Mare needed assistance to foal. (e) Discharges were abnormal either in color, quantity or consistency during the first nine days after foaling. (f) Genital tract was not clean and free from every sign of infection and inflammation when examined on the seventh or eighth day after foaling.

2. Examine and weigh each placenta and note the length of retention.

3. Culture all barren and maiden mares. All mares showing any evidence of infection or marked relaxation in the perineal region,

or tendency toward aspiration of air into the vagina should have the vulva sutured sufficiently low to prevent the entrance of air. Several months should elapse before the mare is recultured, and the uterus should be absolutely normal before any attempt at breeding is made. In some individuals it will take but a few months for the infection to disappear and the uterus to return to normal. In others, however, it may take a year or longer.

4. Vaccinate all pregnant mares against equine infectious abortion (Salmonella abortion) in the fourth and in the ninth month of pregnancy. If a mare aborts, isolate her at once and thoroughly disinfect the surroundings. Abortions occurring early in pregnancy (prior to the fifth month) are usually caused by streptococci. This type of abortion can be controlled by suturing the mares prone to "windsuck" and by practicing good breeding hygiene, such as absolute cleanliness at the time of breeding, examinations, etc. Virus abortion constitutes a severe menace and at present there is no highly effective means of prevention or control.

5. Both mares and stallions should be kept at all times in good physical condition and good genital health. The physical condition of every stallion and mare should be maintained at a high level during the entire year.

6. Foals weak, diseased, crooked, or dead at birth, or dying shortly thereafter, can be kept at a minimum by placing in operation those policies set forth in the foregoing. At this depot during the past four years we have not had a single case of joint-ill or navel-ill (pyosepticemia) and no dystocias have occurred during this same four-year period. I cannot overemphasize the importance of good breeding hygiene (absolute cleanliness at the time of breeding).

ACKNOWLEGEMENTS

Without the helpful advice and coöperation of the late Lt. Col. Lloyd C. Ewen, V. C., this paper could not have been prepared. My predecessors at this depot have exercised painstaking care in keeping the records, and in putting their ideas to work in handling this brood mare band. To them most of the deserved credit is due. Particularly to Lt. Col. Floyd C. Sager, V. C., my immediate predecessor, do I wish to pay my highest respects for the excellent manner in which he handled the brood mares and stallions at this depot.

Captain Jennings weighing a foal. Constant supervision of the health of the foals is an important part of the veterinary service at remount depots

Recent Materia Medica

XIII. The Gonadotropes

By PROF. VICTOR LEWITUS
Nutley, New Jersey

GONADOTROPES may be defined as elements or factors which are capable of stimulating gonadal functions in the male or female, directly or indirectly. However, they are incapable of replacing the sex hormones. The gonadotropes may be classified as (1) pituitary gonadotropins; (2) chorionic gonadotropins; (3) equine gonadotropins.

Pituitary Gonadotropins

Article X of this series (May, 1941), states that the pituitary, and especially the anterior portion, elaborates a secretion which contains numerous hormones. Many are undetermined as yet although their activity is quite well established. One of these factors is well known for its gonadal stimulating properties; although it has been suggested that there are two such factors, some are of the opinion that there may be but one principle which has a dual effect—both follicle-stimulating and luteinizing. For convenience the former is often called the "FS-factor" and the latter the "LH-factor."

It was the scientific pioneering of Harvey Cushing in 1910 which first revealed the close relationship between the sex glands and the anterior portion of the pituitary body. He discovered that when the hypophyseal body was removed in the adult dog, atrophy of the reproductive organs followed. When hypophysectomy was performed in immature animals, development of sexual maturity was prevented. Upon transplantation of glandular material from the pituitary into such hypophysectomized animals, it was found that atrophy of the sex organs and the retardation of sexual maturation in infantile animals could be prevented. Further, it was demonstrated in subsequent studies that the injection of pituitary extracts or implantation of glandular substance into normal but immature female rodents would hasten sexual maturity. Hence it became rather well established that the anterior portion of the pituitary gland was the "governor" of the gonadal functions.

In 1926 Smith (and also Zondek, in some independent experimental studies) showed that the anterior portion of the pituitary body furnishes the physiologic stimulus required for the regulation of the growth and functioning of the reproductive glands of both male and female. Since these discoveries, efforts have been made by various authorities to isolate the active principles from the anterior pituitary, but the complexity of the problem has thus far defied such efforts. A number of research workers have reported the extraction of highly purified fractions, but it is probable that these do not as yet represent the whole number of constituents present to account for such profound activity.

In the hypophysectomized female rat, the FS-fraction appears to cause growth and development of the follicles with an associated increase in ovarian weight. There seems to be a secondary effect, probably due to the estrogens of the newly-developed follicles, in which development of the secondary genitalia occurs. It has been claimed by certain authorities that the FS-factor does not produce a secondary effect on the uterus or vagina. When the FS-factor is administered to the hypophysectomized male, it produces a reaction analogous to that produced in the female. Though there is an absence of effects on the interstitial tissue, and the accessory sex glands remain atrophic, the epithelial tissue of the seminiferous tubules is maintained and sperm production occurs. The LH-fraction appears to have no positive effect on the ovary of hypophysectomized rodents, unless the FS-factor is given simultaneously. Thus it is possible that luteinization and at times ovulation may result. Following the administration of these combined fractions (FS and LH), the ovarian weight increases far beyond the point which could be reached with either of the two factors given sepa-

rately. According to the finding of Evans, Simpson and Pencharz, the LH-factor stimulates the interstitial ovarian tissue. Bunde and Greep found that the LH-factor causes rapid involution of the existing corpora lutea with a concomitant reduction in ovarian weight. It is possible that in hypophysectomized animals, the persistence of preformed corpora lutea may be due to the absence of the LH-factor. In the male, contrary to the effects of the FS-factor, the LH-factor stimulates the functions and causes growth of the interstitial cells; the secondary sex glands also develop probably as a result of male hormone secretion. Parallel to the results found in hypophysectomized females, the combined FS and LH factors augment each other's influence in the male, the resulting synergism producing a much more marked effect than if either fraction were used alone.

It should be stated again that it is not definitely established that two distinct gonadotropic factors exist in the anterior portion of the pituitary. Evidence has been presented for both the dual existence theory and the single-factor theory. The problem is still a moot one.

Certain of the anterior pituitary extracts are available under the trade names ambinon, polyansyn, prephysin, gynantrin, etc.

Chorionic Gonadotropin

Whereas the pituitary gonadotropin is obtained directly from the anterior pituitary gland, chorionic gonadotropin is a mixture of principles found in the urine of pregnant animals, probably originating from the placenta. It formerly was referred to as the PU (pregnancy urine) extract, or the A-P-L (anterior pituitary-like) hormone. The latter designation is inaccurate, since properties of this substance differ greatly from those of the pituitary gonadotropins.

Studies on humans have shown that the gonadotropins excreted by normal young women, by those past the menopause, and by ovariectomized individuals, are qualitatively different than the gonadotropins present in the pregnant female. Incidentally, the gonadotropins of normal men resemble those found in postmenopausal or ovariectomized women.

In 1928, Zondek and Aschheim discovered the presence of a gonad-stimulating principle in pregnancy urine. It has been found also in the blood shortly after the implantation of the ovum. The presence of this principle is the basis for the Aschheim-Zondek (mouse) and Friedman (rabbit) pregnancy test in human beings. The concentration of chorionic gonadotropin (in both blood and urine) increases very greatly during the first phase of conception, the titer being especially high during the first few months. After that, there is a rapid decline in concentration, and finally complete disappearance of the principle. In the placenta, the concentrations run parallel to those found at the different stages already mentioned.

Qualitatively, human chorionic gonadotropin differs from other related gonadotropins. Although originally termed "prolan A" by Zondek because it was thought to be a follicle-stimulating principle, it is no longer so called; and the expression anterior pituitary-like is also no longer tenable, since it does not possess the properties so implied. In immature female rodents, Ascheim and Zondek found that chorionic gonadotropin induces three effects: (a) follicular development, (b) hemorrhagic follicles, and (c) corpus luteum formation. In hypophysectomized animals, this effect is also obtained from the gonadotropin; but in intact animals the results are not altogether due to the gonadotropin since the animal's own hypophysis brings about part of the response. This observation was not made at first, hence erroneous conclusions as to the value of the principle were drawn. Leonard and Smith have shown that when immature female rodents are hypophysectomized and immediately thereafter treated with the substance, corpus luteum formation is stimulated. However, this reaction does not occur if the follicles are not close to maturity at the time of hypophysectomy, if immediate treatment is instituted. Follicular growth in hypophysectomized animals has not been demonstrated following the use of chorionic gonadotropin. Engle has reported the species differences in reactions to human chorionic gonadotropin, and states that the animals in the scale below the primates react similarly, as does the rat. If the pitui-

tary gland is present and functioning, the gonadotropin may stimulate luteinization as well as development of the follicles, frequently resulting in ovulation. Once the hypophysis is removed, estrus may be induced as a result of secretion from the interstitial or thecal cells, but without follicular growth. In humans, it has recently been shown that the ovary may show arrested development and even degenerative changes, but this does not indicate that chorionic gonadotropin is without value. Thus it may be concluded that although the follicular functions are not stimulated some of the luteinizing reactions may be produced. It may be stated that the main difference between the anterior gonadotropin and the chorionic principle is the inability of the latter substance to stimulate follicular functions to any appreciable extent. In primates and humans, neither luteal nor follicular functions are stimulated, the endometrial response being negative. In the male, chorionic gonadotropin acts on the interstitial cells of the testes, causing the production of androgens which, in turn, induce the development of the secondary sex organs. In primates as well as humans, this effect in the male is especially noteworthy. In these species, testicular descent occurs in prepubescent subjects. Hence, chorionic gonadotropin is indicated in cryptorchidism in the human; in fact, this is one of its chief applications. In certain animals, the seminiferous tubules may hypertrophy without affecting the germinal epithelium. However, if recently hypophysectomized rats are treated with chorionic gonadotropin, spermatogenesis is maintained—a function which is not induced in normal immature rats or in rats in which atrophy has already occurred. To indicate the enormous species variation in the response to chorionic gonadotropin, one need only point to the work of Smith and of Scowen who found, respectively, that the monkey and guinea pig do not react in the matter of spermatogenesis as does the rat.

Equine gonadotropin has been used successfully in sheep to increase the lamb crop, both ewes and rams receiving injections. This substance also has possibilities for use in controlling the breeding period

Chorionic gonadotropin is available under several trade names: pregnyl, follutein, pranturon, antuitrin-S, A.P.L., korotrin, etc.

Equine Gonadotropin

A gonadotropin similar to, but not identical with, chorionic gonadotropin has recently been found in the blood (but not in the urine) of pregnant mares. In 1930, Cole and Hart discovered a gonad-stimulating principle in mares during the 40th to the 175th day of gestation. At this stage the gonadotropin reaches a high titer. Although this gonadotropin is probably of chorionic origin, it differs from both the pituitary and the true chorionic hormonal principles. It is not found to any extent in the urinary excretion of the mare, nor is it excreted in the urine after injection into experimental animals.

In immature female rodents, equine gonadotropin stimulates the follicles and luteinization, at the same time increasing ovarian weight. It has the capacity to stimulate the follicles of hypophysectomized rats; and thecal luteinization usually accompanies such action. As far as the effect on hypophysectomized male rats is concerned,

interstitial hypertrophy is similar to that produced by chorionic gonadotropin. The spermatogenic effect in hypophysectomized rodents is likewise similar to that of chorionic gonadotropin. In the guinea pig, similar results have been reported. In the female monkey, follicular stimulation occurs but luteinization is not accomplished. In male monkeys, however, the results are not comparable to those with rodents. In humans, it has recently been reported that the results following the use of equine gonadotropin (pregnant mares' serum) are at present considered not to have any decided advantages over those obtained with chorionic gonadotropic hormones. Briefly summarizing the present knowledge regarding equine gonadotropin: it is capable of inducing ovarian growth in primates and of stimulating the germinative epithelium of the testes and ovaries of experimental rodents. It resembles the pituitary gonadotropin in certain physiologic properties. It should be pointed out that the kidney is nonpermeable to equine gonadotropin, in contrast to other gonadotropins. Hence it may be given in single large doses, and has been found to be as effective after subcutaneous administration as when given intraperitoneally. It is probably more slowly inactivated than the chorionic gonadotropin, which may account for differences in activity.

Equine gonadotropin is marketed under the following trade names: gonadin, gonadogen, and anteron.

Application

In general, it may be said that the gonadotropes may be employed to stimulate testicular or ovarian functions; in faulty conception; and in the absence or disturbance of the estrual period. The pituitary gonadotropins may be used alone or in combination with either the chorionic or equine gonadotropic hormones. The combined form of therapy is at present employed in the case of humans.

In cats, Starkey and Leathem have reported some degree of success when immature females were treated with male urinary gonadotropin. Ovarian weight was observed to increase about eight times over the controls. Not only did follicular stimulation occur, but corpora lutea also developed. Estrual endometria were evident. Fuhrman and Stuhr have reported favorable results in the use of chorionic gonadotropin in foxes; and the same authorities have obtained favorable results in mink (estrus evidenced by sexual swelling and positive vaginal smears) with the use of equine gonadotropin. Sexual swelling following the administration of this hormone was also observed in foxes.

Hart and Cole, employing the equine gonadotropic hormone in stallions, bulls, and boars, found that the activity of the Leydig cells of the testes were stimulated and secondary enlargement of the seminal vesicles and prostate occurred, increasing the potency of the animals. Young sows ovulated at estrus and pregnancy followed mating as a result of administration of the hormone. Cole *et al.* have demonstrated that cows have greatly enlarged ovaries when the hormone is injected. O'Neal has reported excellent results in increasing the lamb crop. Ewes treated with the equine gonadotropin were brought into heat during the period of anestrum, about six weeks prior to the usual breeding season. The rams were injected during the same period. Not only did the number of offspring increase, but they were brought into market almost two months ahead of the season. Thus gonadotropins have possibilities for use in increasing prolificacy and perhaps in controlling the breeding period.

In closing, it should be emphasized that the gonadotropic hormones may be employed not only in combination with one another, but also in conjunction with the various sex hormones, to be discussed in the next article. Although there is much to be learned regarding them,[1] the gonadotropes may be tried without too much risk in the treatment of stubborn cases of infertility, impotence, or improper breeding tendencies.

[1] Some recent observations by Heyl, supported by the work of Townsend and Lucas, point to the interesting possibility of the presence of gonadotropic hormones in the "royal jelly" fed to queen bees. It has always been thought that the jelly contains some sex-stimulating principle because sex organs do not develop in the ordinary workers not fed such a rare diet. When this substance is injected into rats, the ovarian weight increases 60% over that of control animals. Strong follicular stimulation is evidenced by microscopical examinations. "Royal jelly" is produced by the supramaxillary gland, which opens in the region of the mouth, yielding an external secretion. Heyl points out the similarity in position of this gland to the Rathke pouch which gives rise to mammalian pituitary development.

Malignant Edema in a Colt

June 18, 1940, I was called to treat a three-year-old colt, weighing about 1400

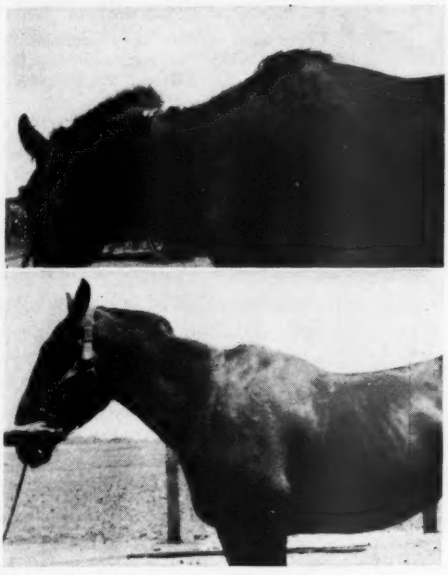


Fig. 1 (above): The infection at its height. Fig. 2 (below): The animal following recovery

pounds, for malignant edema caused by a sitfast infection.

After removing all necrotic tissue, I filled the cavity with boracic acid. The infection continued to spread both anteriorly and posteriorly, involving all the ligamentum nuchae and extending down to the spinous process. The affected area covered approximately 18 inches (Fig. 1).

External treatment consisted of daily removal of all diseased tissue and filling the cavity with a dry dressing powder.

Internal treatment consisted of the administration per os of sulfanilamide, three times a day, using 240gr doses the first day, 180gr doses the second day, and 150gr doses the third day, making a total of 1710gr of sulfanilamide during the three-day course. The sulfanilamide was then discontinued for 24 hours, and repeated until the infection was under control. About 90 days was required for complete recovery (Fig. 2).

The horse has been in harness all summer, the neck being protected with pads, and has been able to work every day with no ill effects.

In my opinion, the fact that this was an open wound, exposed to the sun and atmospheric oxygen, was a large factor in bringing about recovery. Although the sulfanilamide seemed beneficial in this case it in no sense acted as a specific.

A. R. COWSER.

Farmington, Ill.

* * * *

Fracture and Displacement of the Tuber Coxae

A 15-year-old bay saddle horse, kept in a lot with a group of other horses, was found lame in the right hind leg on January 26, 1941. The horse would put little weight on the leg when forced to walk. Although it improved somewhat, the lameness and pain persisted, and four days later it was presented for treatment.

Clinical examination revealed that the right tuber coxae did not protrude nearly so far as the left. On palpation, a portion of the wing of the ilium could be felt in the paralumbar fossa in an area forward, downward, and inward of the original location of the tuber coxae.

The condition was diagnosed as fracture and displacement of the wing of the ilium. An analysis of a blood sample showed a decreased amount of calcium in the blood.

No treatment was prescribed, but rest was advised. The animal was observed six weeks later. The lameness had disappeared and the animal was normal in every respect except for its unsightly appearance, which led the owner to request euthanasia.

Necropsy showed the wing of the ilium fractured in an oblique line extending across the gluteal surface from a point at the beginning of the gluteal line at the crest of the ilium to a point near the grooves of the iliolumbar vessels. The longissimus dorsi muscle had covered and attached itself to the broken edge of the ilium, and the broken edge of the loose piece of the wing of the ilium had fused with the pelvic surface of the ilium in the region lateral to the ileopectioneal line and the articular surface.

E. J. KELLER.

St. Francis, Kans.

Ticks and Their Importance In Small Animal Practice*

By F. R. KOUTZ, Columbus, Ohio
Department of Veterinary Parasitology
College of Veterinary Medicine
Ohio State University

WITH the increase in small animal practice, ticks have become very important as annoying pests and potential carriers of disease in both the small animal hospital and the client's home. Certain species of ticks, formerly limited to the tropics or subtropics, have been transported to and established in many states. These ticks have been spread chiefly by the practice of shipping hunting dogs to the south in winter and by the increased migration in the winter of tourists with their dogs. The so-called brown dog tick, *Rhipicephalus sanguineus*, was limited to a very small area in Texas up to 1912,[1] but since that time it has spread to many other states. With its spread have come new problems for the small animal practitioner who must combat it in the hospital as well as in the homes of clients. The American dog tick or wood tick, *Dermacentor variabilis*, has also become widespread and has been found to aid in the dissemination of disease among animals as well as to carry disease from animals to man.[2]

During the past two years there have been opportunities to examine many species of ticks found on animals brought to the veterinary clinic of Ohio State University. These have included *Rhipicephalus sanguineus*, *Dermacentor variabilis*, and *Ixodes scapularis* from dogs, *Dermacentor albipictus* from horses, and *Haemaphysalis leporispalustris* from rabbits.

■ A great nuisance in small animal practice is the increase in the prevalence of *Rhipicephalus sanguineus*. These ticks not only make themselves a nuisance in the hospital but are carried on the dog to the owner's home, where they become annoying and alarming pests due to their rapid prolification.

Rhipicephalus sanguineus is known as a three-host tick, since it requires three visits to a host before its life cycle is complete. The adult female, after engorging and mating, which requires six to 10 days, drops from the dog, crawls upward along the walls of a room until it reaches a crack or crevice, which it enters, and after several days starts laying many thousands of eggs. In 15 to 25 days these eggs hatch into larvae or seed ticks with only three pairs of legs. The larvae crawl down the walls to the baseboards or floor in search of a dog, which they must find if they are to continue their development. Having found a host, the larvae engorge in three to five days, then leave the host and again crawl upward to find a hiding place in which to molt. They may be found crawling on clothing, behind pictures, along the baseboards and walls; in fact, anywhere they can seek a hiding place. In 10 to 12 days, the larvae molt and develop into nymphs, now having four pairs of legs. These nymphs find a new host and engorge in six to 10 days, then detach themselves and again crawl upward in search of hiding places in which to molt. The molting process requires 10 to 20 days; emerging as adults, the ticks again visit the dog, and the cycle commences again. In each of these stages the tick may survive many months without food, and the period of engorgement and molting may vary considerably.

In addition to being an annoying pest in the United States, *R. sanguineus* has been incriminated as a vector of canine piroplasmosis or malignant jaundice (*Babesia canis*). Although this disease had been reported from many parts of the world and *R. sanguineus* and other ticks have been found to be vectors, the first case of canine piroplasmosis in the United States was reported by Eaton in 1934,[3] in a dog from Florida. Since then many citations of this disease

* Presented at the 14th Annual Conference of the College of Veterinary Medicine, Ohio State University, June 18-20, 1941.

[1] Hooker, W. A., F. C. Bishopp, and H. P. Wood, 1912. The life history and bionomics of some North American ticks. U. S. Dept. of Agr., Bur. of Ent. Bull. No. 106.

[2] Philip, C. B., 1939. Ticks as vectors of animal disease. *Canadian Entomologist*, 71:3, pp. 55-65.

[3] Eaton, Paul, 1934. Piroplasma canis in Florida. *Jnl. Parasit.* 20:5, pp. 312-313.

have been received from the south, naming *R. sanguineus* as an important vector. Cases have been reported in the northern states from dogs that had been living in the south.[4] Another disease reported from other continents as being carried by *R. sanguineus* is canine anemia, caused by *Hepatozoon canis*. This tick is also said to carry *Dirofilaria immitis* but this has not been definitely proved.[5]

As a rule, *R. sanguineus* does not bite man, although several cases of attachment of the nymph to man have been cited. De Jesus in 1939[6] reported an experiment in which numerous attempts to have the larval form attach itself to man, failed.

R. sanguineus can be identified readily by studying its structure; the important identification points are:[7] The scutum (shield) is inornate, brown in color; the basis capituli (head) is hexagonal dorsally; the first coxa is bifid with two strong spurs, and all coxae are approximately the same size; the spiracles are elongated and comma-shaped; eyes and festoons are present; and there are adanal plates on the ventral surface of the males. The bodies of these ticks are usually red-brown in color, but they may vary greatly in color from a slate gray to greenish gray.

■ Another tick that is becoming more important in small animal practice is *Dermacentor variabilis* (American dog tick or wood tick). This tick does not inhabit the small hospital or home, but is usually found in woods, fields, or underbrush. It also is a three-host tick; the larval and nymph stages are usually passed on small wild animals such as field mice, rats, and squirrels. The adult may be found on dogs, man, cattle, and other domestic and wild animals. The danger of this tick, aside from its being an annoying, blood-sucking parasite on the dog, lies in its ability to transmit disease from one animal to another and from animals to man.

The adult female, after engorging and mating on the dog, drops to the ground, usually in a wooded area, and after several days begins laying eggs. The eggs hatch in about 30 days and the larvae or seed ticks crawl up a blade of grass to await a host, preferably a small rodent. The larvae engorge on the host for three to 10 days, then drop off and develop into nymphs. The nymphs in turn climb a blade of grass and wait for another host, again a small rodent, upon which they engorge for three to 10 days. Leaving this host after engorgement, they molt into adults and wait for a larger animal, such as a dog, man, horse, or cow, to which they attach themselves, thus completing the cycle. The time between the molting and engorgement periods varies; the life cycle may be completed in a few months or last for several years, according to the abundance of hosts.

The important identification points of the genus Dermacentor are:[7] The scutum is ornate, having white markings; the basis capituli is rectangular dorsally; in the male the coxae increase progressively in size from I to IV, with coxa IV much larger than the others; the spiracles are sub-oval or comma-shaped; eyes and festoons are present; and there are no plates on the ventral surface of the males.

Dermacentor variabilis has recently been referred to as the eastern Rocky Mountain spotted fever tick because of its ability to transmit the organism causing Rocky Mountain spotted fever[8] (*Dermacentroxenus rick-*

Because of the increasing incidence of small-animal ticks and their importance both as pests and as vectors of disease, veterinarians should become familiar with the different species, the methods of identifying them, and their life cycles in order to combat them efficiently when they are encountered.

[4] Merenda, J. J., 1939. Piroplasmosis in a French poodle. *J.A.V.M.A.* 95:448, pp. 98-99.

[5] Savani, G., 1933. Distribuzione della microfilaria dei cani in Carpi, Novi, Concordia e dintorni. *Arch. Ital. di Sci. Med. Col.* 14:5, pp. 357-364. (Abst. in *Helminthological Abstracts*, Vol. II, Part 5—No. 323a).

[6] De Jesus, Z., 1939. Resistance of the larvae of the common dog tick and their behavior on the human skin. *Philippine Jnl. of An. Ind.* 6:1, pp. 55-60.

[7] Koutz, F. R., 1940. Identification of ticks. *J.A.V.M.A.* 97:763, p. 327.

ettsi) to man. This tick has also been reported to be a carrier of the tularemia[8] organism (*Pasteurella tularense*) from animals to man. Dogs, by bringing the ticks close to the home, aid in the spread of these diseases to man.

A type of paralysis has been reported many times in dogs after the attachment of *Dermacentor variabilis*.[9] After the removal of the engorging tick the symptoms gradually disappear. It is believed that the normal secretions of the engorging tick contain some toxic principle that causes a motor paralysis. *Rhipicephalus sanguineus* also has been incriminated as causing canine paralysis.[10]

■ Several times during the past year, specimens of *Ixodes scapularis* (black-legged tick) from dogs have been brought into the clinic. This tick, with others of the same genus, is a common and annoying parasite on dogs. In the United States, *I. scapularis*, although suspected, has not been definitely incriminated as a vector of disease; but a closely related species, *I. ricinus* (castor bean tick) has been reported as an important vector of disease in other countries.

I. scapularis is a three-host tick which has a wide variety of hosts. The adult female after engorgement and mating on the final host, which may be a dog, man, cow, or other domestic animal, drops to the ground to seek shelter beneath stones, clumps of soil, or vegetation, and begins laying eggs. The larvae climb blades of grass or other low vegetation to wait for a host upon which to engorge. After engorgement, they drop from this host and molt into nymphs, which again climb low vegetation to wait for another host upon which to continue the cycle. The entire life cycle may be completed in six or seven months under favorable conditions, or may last for three years if hosts are scarce. In each stage the feeding period is short, but either the larva, nymph, or adult may survive for long periods without feeding.

The important identification points of the genus Ixodes are: The scutum is inornate, brown in color; the anal groove surrounds the anus anteriorly; the palpi are long with the second article usually narrow at the base; the spiracles are round or oval; eyes and festoons are absent; and there are seven plates on the ventral surface of the males — one pregenital, one median, two epimeral, two adanal, and one anal.

■ During the school year 1939-40, *Rhipicephalus sanguineus* was found in one of the wards of the veterinary hospital, and after some experimentation the following method was developed to eradicate these pests. The cages and floors were cleaned thoroughly with hot water and creolin solution, then steamed. No straw or other similar material was allowed in the cages; paper was used for bedding. A mixture of equal parts of derris and pyrethrum powder was sprinkled in all cracks and crevices of the ward, under the paper in the cages, and back of the window and door casings. All dogs in the ward were dusted with a derris powder compound, containing at least 4% rotenone. A hospital-owned dog was placed in the ward as a control. This control dog was not dusted with the derris powder compound, but was left in the ward so that any tick present would attach to it. It was examined every day and any ticks found were removed and destroyed. All other dogs in the ward were examined daily and dusted with the derris powder compound as long as they remained in the infected ward. None of these dogs were allowed in any other ward in the hospital. During the first several weeks numerous ticks were removed from the control dog; after four months no more were found, although the dog was kept in the ward for seven months. Since then there have been no ticks found in this ward.

Infestation of the hospital has been prevented by examining carefully all dogs brought to the clinic. By this systematic examination we have been able to detect many ticks. *Rhipicephalus sanguineus* is usually found around the ears, head, and in between the toes or, in heavy infestations, anywhere on the body; other species of ticks are especially numerous around the

[8] Parker, R. R., C. B. Philip, G. E. Davis and R. A. Cooley, 1937. Ticks of the United States in relation to disease in man. *Jnl. of Econ. Ento.* 30:1, pp. 51-69.

[9] Wells, J., 1935. Canine tick paralysis produced by Dermacentor variabilis. *N. Am. Vet.* 16:1, pp. 41-42.

[10] Farquharson, J. and H. Bly, 1939. Tick paralysis in Colorado. *N. Am. Vet.* 20:2, pp.51-53.

ears, head, and neck, although they also may be found on other parts of the body. If *R. sanguineus* is found, the dog is placed in a special ward in a building adjacent to the hospital in which the cages are several feet from the wall and are standing in a large, flat pan filled with a pyrethrum disinfectant solution. The pan is about one inch deep and large enough so that it projects about six inches entirely around the cages. The animal is examined every day for ticks and then dusted with the derris powder compound. When the dog leaves the hospital the cages are thoroughly cleaned with creolin and scalding water. If the ticks are identified at once as other types (*Dermacentor variabilis* or *Ixodes* spp.) they are removed, and the dog is dusted with the derris powder compound and placed in the regular wards.

■ In forcibly removing ticks from dogs there is always some danger of abscess formation from mouth parts which have been torn from the body of the tick, and left in the flesh. Many drugs were tested on individual ticks to determine which would cause the tick to withdraw its mouth parts from the skin of the dog. Tincture of iodine, ether, chloroform, alcohol, tetrachlorethylene, carbon tetrachloride, lime sulphur solutions, and others were used. Most of these drugs killed the ticks, but they still remained fast with their mouth parts in the flesh; the alcohol did not kill the ticks, although it caused them to release their hold; ether killed the nymphs and caused them to release their hold, but had no effect upon the adults, which still remained fast and had to be forcibly removed. The best results were obtained from the use of derris powder compound, dusted freely on the dog before placing it in the isolation cages. Several hours later most of the ticks were found dead and loose in the hair or dead on the floor of the cage. By repeating this treatment several times all ticks were removed from heavily infested dogs without injury to the skin or without any danger of mouth parts being left to form abscesses.

Although we have found derris powder compound to be quite effective in removing ticks, some other methods, such as dips, have been widely used and recommended. Bishopp[11] recommends the use of a derris dip which is made by mixing two ounces of fine derris powder, containing not less than 3% rotenone, one ounce of neutral soap, and one gallon of tepid water. This solution may be applied to the dog with a brush or used as a dip. The liquid is allowed to dry on the dog or the excess liquid removed with towels.

During the winter of 1940-41, many calls were received from persons who had found *Rhipicephalus sanguineus* crawling over the furniture, on rugs, on clothing in the closets, along the walls, and on small babies. They were advised to sprinkle derris powder compound in every crack and crevice, especially along the baseboards; to dust the dog with derris powder compound every day; and to remove and burn any ticks found. By these methods, the owners have been able to completely eradicate these pests from the homes.

■ While having no direct bearing on the subject of ticks in small animal practice, it may be of interest to know that last winter a number of ticks were received from northern Ohio which had been found on 25 horses brought from the west. Upon examination these ticks were found to be *Dermacentor albipictus*, which has many common names, such as winter tick, elk tick, deer tick, moose tick, or horse tick. This is a one-host tick which attacks many wild and domestic animals during the winter. The adult female, after engorging, drops from the host to the ground and waits until spring before laying eggs. The larvae or seed ticks group together during the summer and wait until cold weather before seeking a host. The larvae feed and molt into nymphs and the nymphs feed and molt into adults on the same host animal. The ticks become adult six or seven weeks after the larvae first attach themselves.

This is the first report of the occurrence of *Dermacentor albipictus* in Ohio; it is quite probable that more of this species will be found in this section in the future.

[11] Bishopp, F. C. and C. N. Smith, 1938. Combating the American dog tick, carrier of Rocky Mountain Spotted Fever in the central and eastern states. U. S. Dept. of Agr., Bur. of Ent., Cir. E-454.

Plants Poisonous to Live Stock in New York*

It has been estimated that there are over two hundred different species of poisonous plants to be found growing in New York State. Some of these are cultivated in gardens, but the majority are to be found wild in fields, marshes, woods or along the roadside. The plants discussed in the following pages are important because of the danger, when eaten by live stock. Others are dangerous because they are apt to eaten or handled by humans, particularly children.

Brake Fern or Bracken (Pteridium Latiusculum)

Found on dry, sandy or gravelly soil, particularly in neglected pastures or open dry woods.

Young shoots are sometimes cooked and eaten as greens or pot herbs. Thorough cooking removes the poisonous ingredients, leaving the greens harmless and nutritious.

Ordinarily brake ferns are not eaten by cattle, except during the latter part of a dry season when normal forage is scarce. At such a time these plants are among the few to remain green, and are apt to be browsed heavily. Hay containing appreciable amounts of this fern should not be fed to either cattle or horses as the poisonous character is not lost on drying of the plant. Hogs eat all parts of the fresh plant without injury, in fact, appear to relish it, especially in the autumn.

Symptoms of poisoning usually appear after two to four weeks of continuous grazing and include: very high temperature, extreme salivation, bleeding from the nose followed by hemorrhages of internal organs.

Field Horsetail (Equisetum Arvense)

Common on sandy, poorly drained soils of meadows and pastures.

This plant has been found to be most injurious when present in hay fed to horses, as hay cut from low, damp meadows often contains considerable quantities. Horsetails in pastures do not seem to be harmful, probably because the laxative green feed eaten with them causes them to be excreted before the poison affects the system. Other species of this plant are also capable of producing like symptoms.

Symptoms appear in two to five weeks in the following order: unthriftiness and loss of weight, loss of muscular control followed by swaying and staggering. The animal usually falls and cannot arise. Violent struggle then weakens the animal and death is caused by exhaustion. Horses treated before falling can usually be saved.

Sorghum (Andropogon Sorghum)

Cultivated as green feed for cattle. Under certain conditions is a deadly poison to the catle, as little as one pound being sufficient to kill a one thousand pound animal. The poisoning is due to the presence in the plant of a glucoside, dhurrin, which on being eaten is acted upon by certain enzymes, releasing hydrocyanic acid. The conditions under which sorghum is most poisonous are: (1) after extreme periods of drought, or when growth has been stunted from other causes; and (2) when cattle are turned in to graze for the first time on a field of it, serious results may follow unless the cattle have been previously conditioned by having been fed some concentrate.

Symptoms appear very quickly. In about 15 minutes after an animal eats sorghum plants high in HCN, it will fall to the ground and soon present the symptoms of a horse with colic. Within an hour consciousness is lost and death soon follows.

HCN poisoning depends upon the amount of poison present, but this is variable. Vigorous plants seldom contain it in sufficient quantities to be injurious. Whenever there is any doubt about the poisonous nature of the sorghum one should feed some concentrate before feeding the sorghum, because it has been found that the presence of sugars prevents the liberation of the HCN when they are fed in sufficient amounts.

Wild Garlic, Wild Leek (Allium Vineale)

An introduced plant common in pastures and meadows. Other species are frequently found in woodlands and damp places. They are easily recognized by their characteristic onion or garlic-like odor. While not to be considered as poisonous in the sense that

* Selected from a mimeographed bulletin of the Department of Botany, New York State College of Agriculture.

they endanger the life or health of the animal, they merit inclusion here because when cattle graze on pastures where these plants are growing, the milk produced by them will be contaminated with a "garlic" flavor.

It appears that it is not necessary for a cow to eat the plant in order to transmit the odor to the milk. Experiments show that tainted milk results if the cow merely inhales the volatile substances from fresh wild garlic tops.

Death Camas (Zygadenus Chloranthus)

Found in only a few isolated areas in New York State, primarily in the marl bogs in Genesee County.

All animals are poisoned on eating the plant and children have been poisoned by eating the bulbs. Symptoms include salivation, vomiting, difficult breathing and muscular weakness followed by prostration. This condition may continue for a period of a few hours to several days before death occurs. No satisfactory treatment is available.

False or Green Hellebore (Veratrum Viride)

Plants of wet or swampy ground, particularly along streams or low meadows and frequently in wet open woods.

They are usually conspicuous in scattered clumps. Animals avoid eating them because of the sharp burning taste due to the presence of a poisonous alkaloid. Usually it is young animals unfamiliar with them that eat them with fatal results.

Buckwheat (Fapopyrum Esculentum)

Cultivated for grain, as a cover crop or green manure crop.

Plants just ready to bloom, when eaten by cattle are likely to cause bloat due to the presence of the glucoside, indican. When foliage or grain is fed to hogs, an eruption or rash on the skin often appears, particularly about the larger joints.

Similar symptoms, accompanied by severe itching, may appear in susceptible individuals after eating pancakes made from the flour of buckwheat seeds.

Corn Cockle, Purple Cockle (Agrostemma Githago)

An introduced weed characteristic of winter wheat fields.

Wheat screenings containing large amounts of the seeds of this plant are dangerous when fed to poultry. Less than an ounce of the seed will kill a hen, and proportionally larger amounts are equally dangerous when in the feed of other live stock. Wheat flour containing ground particles of the seed is dangerous as a food for man.

Symptoms are: Colic, vomiting, salivation, paralysis and death.

Bouncing Bet (Saponaria Officinalis)

The seeds of this common weed contain the same poisonous substance (saponin) as does corn cockle, and are equally dangerous when in poultry feeds, dairy rations or bread flour.

Buttercup (Ranunculus Species)

These plants are found in a wide range of habitats, from dry, open pastures to wet swamps and bogs.

There are many species, all of which are poisonous when eaten by live stock. The poison is an acrid, volatile substance which leaves the plants as they dry; hence hay containing dried buttercups is harmless. Because of the bitter taste, buttercups are usually avoided by cattle, and it is only when growing in damp soft earth where they are easily pulled up along with other vegetation that poisoning occurs. Cases of abortion in cattle have been traced to the action of these plants.

Marsh Marigold, Cowslip (Caltha Palustris)

These plants, with their showy yellow flowers in early spring, are common in wet marshes and swamps. Many people use them for pot-herbs, because when they are thoroughly cooked the poisonous principle is lost. Although of an acrid and bitter taste, the plants are occasionally eaten by live stock. Sheep, cattle and horses have been poisoned by them.

Dutchman's Breeches (Dicentra Cucullaria)

A spring flowering native plant found in moist leaf mold of open woods and woodland pastures.

Although the plants are unpalatable to live stock, cattle will eat them in early spring before other vegetation is available, and at such times numerous cases of fatal poisoning have been reported. The danger is usually past by the last of May, except

at high altitudes where the season is later.

Symptoms include trembling, frothing at the mouth and convulsions accompanied by difficult breathing and moaning.

The safest procedure is to keep animals from areas where this plant is growing until there is considerable other forage for them to eat. All species of this genus are harmful.

Mustard or Charlock (Brassica Sp.)

Yellow-flowered weeds of open fields, common throughout the early summer. Seeds of these weeds cause death to poultry when eaten in sufficient quantities in mash or scratch feeds.

Wild Black Cherry (Prunus Seretina)

A small tree or shrub widely distributed and particularly common along roadsides and fences.

The fruits of this plant, used in making wine, are not considered poisonous.

The foliage contains HCN, which is more abundant in wilted than in fresh leaves.

Water Hemlock

The symptoms are similar to those of sorghum poisoning. A pound of wilted leaves is sufficient to kill a one thousand pound animal. Care should be taken not to leave pruned branches of this plant within reach of live stock; by no means pile them for subsequent burning in a pasture where they may be eaten.

The poisonous character of Choke Cherry (*Prunus virginiana*) and of Fire Cherry or Pin Cherry (*Prunus pennsylvanica*) is similar to that of wild black cherry, and these plants should receive the same consideration.

White Sweet Clover (Melilotus Alba) and Yellow Sweet Clover (Melilotus Officinalis)

Introduced plants, usually roadside weeds in New York State, also used as a source of honey for bees. Both are cultivated as hay in the northwest.

When cattle are fed on an exclusive ration of sweet clover hay, cases of poisoning may occur. The so-called sweet clover poisoning does not occur when feedings of timothy or prairie hay are alternated with the sweet clover.

Lupine (Lupinus Perennis)

Widely distributed on the dry soils of fields, pastures and woodlands, but not common in New York State.

The presence of poisonous alkaloids in this plant (as well as in other species of the same group) make it dangerous for live stock to graze in pastures where it occurs. However, large amounts of the plant must be eaten before symptoms are evident. Since the plant is not common here, the danger is not great as it is elsewhere. This group is one of the important sheep poisoning plant genera of the west.

St. John's Wort (Hypericum Perforatum)

An introduced perennial weed on dry sandy soils of old pastures and meadows as well as along roadsides and on waste lands.

The eating of this plant by live stock leads to a photosensitization and subsequent dermatitis of the unpigmented portions of the skin. White skinned cattle, horses and sheep in strong sunlight show the most striking symptoms, while animals with pigmented skin or animals not exposed to

bright sunlight are reported not to show any symptoms from these plants.

Symptoms include the blistering of the skin and the falling of the hair, with ulcers resulting.

Ordinarily, unless no other vegetation is available, animals do not eat enough of the plant to cause pronounced symptoms.

Poison Hemlock (Conium Maculatum)

An introduced plant, frequent along borders of fields, meadows and roadsides.

This plant is poisonous to both man and live stock. It was used by the ancients to poison criminals condemned to death, and it is said that Socrates was poisoned by it. The plant has a strong, disagreeable odor, and because of this, it is usually avoided by cattle.

Water Hemlock or Cowbane (Cicuta Maculata)

A native plant found in marshy wet meadows and pastures and along ditches and streams.

This is one of the most poisonous of our native plants, small amounts being fatal to man or to live stock. The seeds and roots are more poisonous than other parts of the plant. In the early spring cattle pull up the fleshy roots along with the tops of other plants growing in soft, wet ground. It is said that the roots of a mature plant can kill a cow within half an hour after eating.

Bulbous Water Hemlock (*Cicuta bulbifera*) is a plant of similar habitat, and is very poisonous also.

Mountain Laurel (Kalmia Latifolia)

A native shrub of pastures, dry hillsides and bogs, on acid soils.

The foliage, flowers and seeds of this plant are poisonous to all live stock except deer, which appear to be immune to it; horses and even goats have died from eating the leaves. Older cattle are not so frequently killed by it as are young stock, probably because while neither will eat very much, the small amount eaten is sufficient to kill a small, immature animal but not a large full-grown one.

Lamb-kill or Sheep Laurel (*Kalmia angustifolia*), and Swamp Laurel (*Kalmia polifolia*), present poisonous characteristics similar to those of Mountain Laurel.

White Snake Root (Eupatorium Urticaefolium)

A native plant common in pastures and open woods.

Cocklebur

This plant produces the disease known as trembles or milk sickness in live stock. Because the plant has a disagreeable flavor, it is not eaten unless the field is very poor or overpastured. The poisoning may be chronic or the results fatal, depending on the amounts eaten during a given period.

A trembling of the voluntary muscles often indicates that the animal has white snake root poisoning; in severe cases this is followed by constipation, loss of appetite, and emaciation. With the resulting weakness the animal is unable to stand. Respiration becomes difficult and the breath has a fetid odor. At this stage fatal results are usually certain. The flesh of animals dying from this disease is deadly poisonous to other animals (including man) which eat it. Milk and dairy products from affected cows are also poisonous.

Cocklebur (Xanthium Orientale)

An annual plant of fields, roadsides and waste places, especially river bottoms subject to overflow.

The seedlings of this plant, especially those having the two seed leaves (cotyledons), are poisonous to live stock, particularly hogs. As the plants become older and more foliage is produced, the danger of poisoning is materially lessened.

An Anomaly of the Foot in the Dog: Congenital Absence of Two Digits

By HARRIS W. HANTMAN, Waltham, Massachusetts
Department of Surgery and Medicine
School of Veterinary Medicine, Middlesex University

DEFORMITIES of the foot may be congenital or acquired. While they are often symmetrical, they may occur in only one foot. The subject of congenital anomalies is extremely large, involving as it does all the errors which may occur during the complex process of development. In all species of animals, man included, body shape and conformation of organs, conform to a type. The recurrence of this type is looked upon as the normal. Whenever a deviation from the normal is observed, so that an individual is malformed, it is spoken of as an anomaly.

Fig. 1. The patient in standing position. Note left foreleg

October 21, 1938, a one-year-old, female, wire-haired fox terrier of good disposition, active and lively, was presented to the veterinary clinic of Kansas State College, the owner requesting that special attention be given to a malformation of the dog's left foreleg. She was one of a litter of five registered pups, kept by the owner because the deformity made her unsalable.

On standing or sitting, the animal rested the deformed foot in such a position as to make all the toes, including the fifth, visible when viewed from the front. The affected leg was twisted outward slightly (Fig. 1). Part of this deviation probably was brought about by mechanical influence exerted on the extremity during growth, and part by disturbances in development.

The terrier showed no unsoundness in walking, although in trotting, or running, a slight limp was occasionally noticed, and at times there was a tendency to carry the leg as though the pad were sensitive. However, her locomotion was not so impeded as to present any definite clinical symptoms of lameness. The wiry hair helped to cover the malformation, so that the condition was not immediately noticed on casual observation.

On palpation the carpal bones felt much thicker than in the opposite normal leg; however, the size and shape of the wrist did not appear out of proportion when contrasted with the opposite member. Movement of the radiocarpal joint was normal. The radius and ulna showed no external abnormalities.

X-Ray Examination

On examination, the anteroposterior view (Fig. 2) of the affected leg presented a rather interesting picture. The distal extremity of the radius showed no abnormalities and fusion of the epiphyseal ends of the distal extremities of the radius and ulna had begun. The center of ossification of the radio-intermediate carpal bone was still slightly visible. The third carpal and ulnar carpal bones were absent. The first digit was hypertrophied and there seemed to be an absence of the second and fifth digits.

Etiology

There are several etiological theories of congenital anomalies of the hand and foot. The theory of mechanical outside pressure does not seem to be a likely explanation in this case, for the total absence of two digits leads one to believe that it would be highly improbable for some outside disturbance to act on so small an area in an early developing embryo, or for any outside pressure to affect such a localized area.

The most probable theory is one of an in-

Fig. 2.* Radiograph showing anteroposterior view of the normal foot in contrast with that of the abnormal foot

herent cell defect, or of the failure of the factor responsible for development of this part early in embryonic life, resulting in suppression of this portion of the embryo. Theorizing as to the cause of this failure, Virchow attributes these congenital anomalies, as well as club-foot, to some inflammatory process which has disturbed the developing organism. The actual cause of such a defect is not known; however, according to Forbes,[1] Goldmann concluded from the investigations of Gotte, Stasse, and Goldmann on triton larvae, and Wiedersheim on proteus larvae, that at some time during its development, the carpus consists of three parallel rays of tissue which subsequently split into the individual carpal bones. The radial ray gives rise to the thumb (first), the middle ray to the index (second) finger, and the ulnar ray to the third, fourth, and fifth fingers. Any or all three may be involved in abnormalities. If this view be accepted, the absence of the second and fifth digits in this case would be explained by suppression of the middle and partial suppression of the ulnar ray. Goldmann's theory of the development of the hand is supported by Kanavel[2] in his review of congenital malformations of the hand.

Doctor Schlotthauer of the Mayo Foundation, in commenting on the x-ray plate, says that he is unable to classify this condition. "It is merely a peculiar anomaly. From the x-ray picture I would be inclined to think that there is a hypertrophy of the first digit and an absence of the second and fifth. However, I do not know how anybody could be certain which digits are missing."

The malformation is a peculiar one. The author has not found a like case recorded in veterinary literature. Since the condition does not affect the lifespan of the dog, nor materially impair its usefulness, it was subjected only to a clinical and general study as a scientific curiosity.

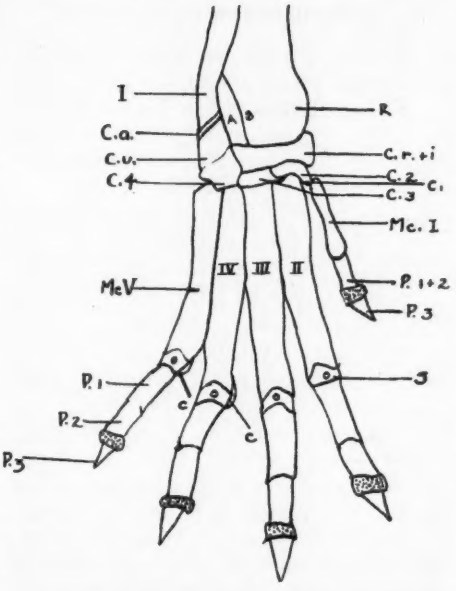


Fig. 3. Skeleton of distal part of right thoracic limb of normal dog, dorsal view. The digits are spread. I, distal end of interosseous space; R, distal end of radius; C.r. + i., radio-intermediate carpal; C.u., ulnar carpal; C.a., accessory carpal (very small part visible); C.1, C.2, C.3, C.4, first to fourth carpal bones; Mc.I, metacarpal bone of first digit; P.1 + 2, first and second (fused) phalanges of same; P.3, third phalanx of same; Mc.V, fifth metacarpal bone; P.1, P.2, P.3, phalanges of fifth digit; S., dorsal sesamoid; c, c, volar sesamoids.—*Adapted from Sisson*

[1] Gilbert-Forbes, 1938. A case of congenital club-hand. *Anat. Rec.*, 71, pp. 181-189.

[2] Kanavel, A. B., 1932. Congenital malformations of the hands. *Arch. of Surg.*, 25, pp. 1-53.

Radial Paralysis in a Cow

February 8, 1941, a call was made to a farm to see a six-year-old purebred cow.

The animal was down, but could stand after she was assisted to rise. When standing she stood with the right front leg flexed at the carpal and fetlock joints, resting the toe of that foot on the ground in advance of the left one. She could bear no weight on the affected foot. Temperature and respiration were normal.

Radial paralysis in a cow

The cow was about eight months pregnant, and had been wintered in a lot with about 50 other pregnant cows. The herd was fed ensilage, alfalfa hay and cottonseed meal with a mineral supplement.

Twenty days previously it had been noticed that this animal was lame in the right front leg, and in four or five days it had become impossible for her to rise unassisted. At this time she was put in a lot by herself.

The diagnosis was radial paralysis, caused either by traumatism or by some pathological condition affecting the radial nerve. Exercise and rubbing the area with liniment were prescribed. No improvement being shown in a month, the animal was slaughtered. On necropsy the nerve was found to be enlarged and edematous.

Radial paralysis causes a loss of function of the extensors of the front leg, the nerve supply of which branches from the radial nerve. The tonus of the opposing flexors causes flexion of all joints of the leg below the elbow. When the foot is placed properly and the carpus held in a normal position, weight may be borne on the affected leg.

According to Frank[1] the radial nerve is subject to trauma in the subcutaneous tissue as it crosses the radius just above the lateral epicondyle to reach the lateral surface. In cattle and horses it may be injured by falling, heavy pulling, or overstretching. Paralysis is often associated with fracture of the first rib.

MARVIN STITT

Clearwater, Kans.

* * * *

Pre-Operative Use of Sulfanilamide

Sulfanilamide has been the object of much attention and also the subject of many discussions in the field of veterinary medicine and in veterinary literature. However, the writer has no knowledge of its having been reported in the treatment of badly infected scirrhous cord in the soliped.

History.—June 3, 1940, Dr. C. C. Vierling was called to the farm of the owner of a two-year-old, registered, American saddle horse which was lying unable to rise without assistance. The animal had been castrated by another veterinarian four weeks previously.

Symptoms.—The temperature was 104.6° F. After assisting the animal to arise an examination revealed extensive swelling of the sheath and scrotum and adnexa. Further examination disclosed two much enlarged scirrhous cords. One of the swollen cords was discharging a purulent fluid.

Treatment.—Because of the weakened and debilitated condition of the patient it was deemed inadvisable to operate immediately. As preliminary treatment 150cc of a commercially prepared 1:1000 phenylmercuric nitrate solution was given intravenously and 10gm of sulfanilamide per os. The owner was instructed in the application of hot wet packs of concentrated magnesium sulphate solution twice or three times daily in order to reduce the swelling. Sulfanilamide tablets were dispensed with directions to the owner to give 10gm daily.

By June 6th the temperature of the patient had returned to normal and the swelling had been markedly reduced. Surgical

[1] Frank, E. R., 1939. *Veterinary Surgery Notes*, p. 73.

removal of the infected tissues was then undertaken. The patient was given two ounces of chloral hydrate via stomach tube and cast in dorsal recumbency. The tissues were infiltrated with a 2% procaine solution.

All infected tissues were removed by blunt dissection where possible. It was necessary to ligate some of the larger vessels to control hemorrhage.

Following the operation the owner was advised to continue with the administration of sulfanilamide with the dosage reduced one-half.

Uneventful recovery followed the operation and the animal is now in training.

MYRON D. REED

Smith Center, Kans.

* * * *

Effects of Phenothiazine on the Equine Blood Picture

December 2, 1940, two 3-year-old Percheron horses, weighing 1400 pounds each, were each given six ounces of phenite (a commercial phenothiazine solution containing 12gm of the drug per ounce) in order to study the effect of this drug on the blood picture. The amount administered (72 grams) was about 1½ times the therapeutic dose usually recommended for animals of this size, but considerably smaller than experimental doses which others[1, 2, 3] have found to be nontoxic for horses.

The two horses appeared to be in good condition; a fecal examination, however showed a moderate strongyle infestation.

An egg count was made prior to administering the drug and each subsequent day (except Sunday) for eight days thereafter, using Dr. J. H. Whitlock's modification of the Stoll technic, as follows:

1. Mix two grams of feces with enough water to make 30cc.
2. Strain with a tea strainer.
3. Add 30cc saturated sugar solution and mix.
4. Place 0.3cc of this mixture on a slide, count the eggs, and multiply by 100 to obtain the total number of eggs present in one gram of feces.

Blood counts were made on each day of the experiment. The results of the egg counts and blood examination are shown in the accompanying table.

HORSE NO. 1 GIVEN 6 OZ. PHENITE 12/2/40

	R.B.C.	Leucocytes	Hem. Gm. per 100cc	Eggs per Gm. feces
12/2/40	7,240,000	12,200	11	466
12/3/40	7,262,500	12,600	11	332
12/4/40	7,010,000	11,300	10.5	0
12/5/40	6,150,000	11,200	8.5	66
12/6/40	5,837,500	10,300	7.5	0
12/7/40	5,150,000	10,800	8.5	0
12/9/40	7,112,500	10,040	9.5	0
12/10/40	7,411,500	10,900	11.5	0

HORSE NO. 2 GIVEN 6 OZ. PHENITE 12/2/40

	R.B.C.	Leucocytes	Hem. Gm. per 100cc	Eggs per Gm. feces
12/2/40	6,250,000	11,350	8	633
12/3/40	6,600,000	12,000	12	400
12/4/40	6,450,000	12,500	9	432
12/5/40	6,712,500	16,500	8	0
12/6/40	5,275,000	11,600	7.5	0
12/7/40	6,050,000	11,000	8	0
12/9/40	5,887,500	10,100	8	0
12/10/40	6,450,300	10,400	8.5	0

It will be noted that there was a slight decrease in the number of red blood cells, leucocytes, and hemoglobin following administration of the drug. This decrease continued for four or five days, when the blood picture began to return to normal. The decrease in the number of erythrocytes was not serious in these cases; however, if the animals had been anemic at the time the phenite was administered, this additional decrease in the number of red blood cells might have had deleterious effects.

The efficiency of the drug as an anthelmintic is indicated by the fact that at the end of four days the feces of both horses were negative for strongyle eggs and remained so throughout the experiment.

Since only two animals were used in this experiment, no general conclusions can be drawn from it. However, the data correlate with those of Errington[4] in that they show a decrease in the number of erythrocytes beginning on the second day after the administration of phenothiazine.

CLAIR TOYNTON

Dodge City, Kans.

[1] Lapage, Geoffrey, 1940. Experiments on the anthelmintic action of phenothiazine. *Vet. Rec.* 52:36, pp. 648-657.
[2] Britton, J. W., 1941. The materia medica of phenothiazine. *Cor. Vet.* 31:1, pp. 1-12.
[3] Habermann, R. T., P. D. Harwood, and W. H. Hunt, 1941. Critical tests with phenothiazine as an anthelmintic in horses. *No. Am. Vet.* 22:2, pp. 85-92.
[4] Errington, B. J., 1941. Phenothiazine as an equine anthelmintic. *Vet. Med.* 36:4, pp. 188-193.

Abstracts

Cows "Hold Up" or "Let Down" Their Milk

There are cows which habitually hold up their milk and others which let it down. These phenomena have caused confusion because investigators have failed to distinguish between (1) the secretion of milk within the alveoli and (2) its ejection from the alveoli to the larger ducts. These are two separate and distinct processes (Hammond, 1913; Gaines, 1915; Macy, 1930). Posterior pituitary extract has a galactagogue action. Drugs have no effect. Corpus luteum, pineal and suprarenal (adrenalin) extracts, also fright, have an inhibiting action on these phenomena. Nursing at one gland causes continued functioning in adjacent glands although they are not suckled. The nervous system does not control the combined acts (Routh, 1897; Ribbitt, 1898). To study the rôle of the nervous mechanism of the mammae in the ejection of milk, the authors[101] performed unilateral neurectomy on the ilio-inguinal and posterior inguinal nerve trunks in dry cows and then compared the development and the milk secretion of the two halves of the udder, the one unnerved and the other intact. Photographs of these udders taken shortly after the cows had freshened show that there was no perceptible difference between the development of the two halves nor any material difference in the amount of milk each half yielded. The authors' conclusions are that neurectomy of the gland during the dry period has no effect on the rate of ejection of milk during a subsequent lactation. The holding up or letting down of milk lies in the delicate balance between the inhibitory action of the suprarenal and the stimulating action of the posterior pituitary glands. Milk is "let down" when the oxytocin of the pituitary causes the muscles of the alveoli and tiny ducts to contract and the milk is "held up" when adrenalin prevents that contraction. Other factors may affect the glandular activity, but do not in themselves initiate or inhibit the letting-down.

[101] Ely, Fordyce and Peterson, 1941. *Jnl. of Dairy Sci.* 24:3, pp. 211-223.

Pathogenesis and Treatment of Azoturia

According to the author,[104] this disease is caused by lesions of the vago-sympathetic system. When that nerve system is injured, it can cause disturbance in the suprarenal gland affecting its secretion, especially of the cortical stratum, resulting in a deficiency of intramuscular oxidation, and consequently an excess of lactic acid. On this theory, the following is indicated in the way of treatment: stimulants of the sympathetic system—adrenalin, ephedrine, sodium hyposulphite, blood transfusions—or vagus depressors such as atropine and belladona. Glycerophosphates should be administered in any case. It is worthwhile to try injections of cystein hydrochloride.

* * * *

Treatment of Paralysis of the Retractor Penis in the Horse

A new treatment for paralysis of the penis in horses seems to be very successful if started in time.[102] It is a very simple method of curing this affection and particularly valuable in army horses, because it may be used as well in active service as in the evacuation sections and hospitals. Immediately after the appearance of the paralysis, the sooner the better, a suspensory is used to raise the penis to a horizontal position and retain it close under the abdominal wall. The suspensory should consist of a leather plate 40cm long and 20cm wide, a folded sack of the same size, or any kind of canvas rendered stiff by means of a wooden or iron frame; this apparatus should be fixed and kept in place by strips passing over the animal's back. It is perhaps unnecessary to state that the foregoing refers to the inability to retract the penis that is a result of overwork and exhaustion, and that the general condition should be treated by appropriate measures. It is essential to protect the penis from extreme traumatism due to its exposed position and from edema conse-

[104] Urbain, G., 1936. Essais sur la pathogeni et le traitement de la paraplégie hémoglobinurique du cheval. *Ann. de Med. Vet.* Aug.-Sept. 1936, p. 355—Abst. in *Rev. de Path. Comp.* 40:518, p. 90.

[102] Péan, H., 1940. Traitement de la paralysie du pénis chez le cheval. Rec. de Méd. Vét. d'Alfort 106:2, p. 67.

quent upon its dependency and interference with the circulation in it.

The efficiency of this method has been confirmed under extremely bad conditions on 15 horses withdrawn from the army. In these cases the onset of paralysis had occurred 8, 10, 12, 20, and 21 days before the beginning of the treatment and extensive lesions resulting from traumatisms already existed. The majority of these animals were soon back in active service.

Sodium Citrate in Veterinary Therapy

Citrate of sodium was introduced in therapy as an adjunct to blood transfusion.[107] Its practical applications have increased chiefly because of its two properties, which seem at first paradoxical; its anticoagulant action and its hemostatic effect. In human medicine it has been used with advantage in the treatment of many affections.

One of its biological properties is the anticoagulant effect *in vitro* at weak concentrations (2 to 3%), leaving untouched the physical properties of the blood; on the other hand, 30% solutions have an antihemorrhagic effect *in vivo*. If injected intravenously in sufficiently high doses, sodium citrate may cause in men and animals a shock similar to anaphylaxis. This can be avoided by injecting it very slowly. It is used as a hemostatic agent in serious cases of hemorrhage; for example, in race horses.

In fat dogs or dogs affected by eczema, it appears to be efficacious when administered per os in association with diuretics for two weeks; the dose is 0.5 to 1gm. In horses of normal size, the dose is 20 to 25gm. The salt must be pulverized and dissolved in 80 to 100cc of tepid sterile water; 10gm of magnesium chlorate may be added if desired. The injection must be made intrajugularly, and performed as slowly as possible to avoid local irritation or shock. The solution must be freshly prepared because it deteriorates easily and loses its efficacy. In dogs the regular intravascular dose is from 0.15 to 0.20gm per kilogram of body weight.

[107] Druillet, 1938. Les proprietes et les indications du citrate de soude en therapeutique vétérinaire. Thesis, Toulouse University. Abst. in *Ann. Méd. Vét.* 84:11 (Nov. 1940), p. 476.

Human Vaccination Against Brucellosis in France

Attention is drawn to the inefficiency of sanitary legislation dealing with brucellosis in France, and to the consequent danger of increase in the infection rate of human beings. The authors[108] hold the opinion that preventive vaccination of animals should be carried out, and they refer to promising results which, in their opinion, were obtained by the use of a vaccine prepared by them from living, avirulent *Br. suis*. As it is practically impossible for suitable hygienic measures to be adopted by all persons who come into contact with infected animals or their products, vaccination of human beings in infected areas is advocated, and in this connection the authors describe trials made by them with a vaccine prepared from human, caprine, and ovine strains of *Br. melitensis* and from *Br. abortus* and *Br. suis*.

Durable Immunity Conferred by Tetanus Anatoxin

The authors[110] tested the immunity of 126 horses vaccinated between 1929-37. Vaccination was by two injections at an interval of one month, each of 10cc of tetanus anatoxin in tapioca. A third inoculation of 10cc was given, usually one year afterwards. The immunity conferred was found to be remarkably solid and constant, the antitoxic power of the blood being at least 1:100 in 93% of the animals, often reaching 1:3 or higher and never being lower than 1:300. The degree of immunity shown by horses vaccinated eight to ten years before was similar to that of animals vaccinated only two to three years previously. As a titer of 1:1000 insures resistance to a lethal dose of tetanus spores, the extent of immunity acquired by these horses may be easily judged.

The superiority of active immunization with tetanus anatoxin over passive immunization with antiserum is stressed. Between 1925 and 1929, out of 13,000 horses treated

[108] Dubois, C., and N. Sollier, 1939. Inefficacité de la legislation sanitaire contre la brucellose et necessité de la vaccination préventive de l'homme en milieu infecté. *Bull. Acad. Med. Paris*, 121, pp. 256-261. Abst. in *Vet. Bul.* 11:5, p. 288.

[110] Ramon, G., and E. Lemetayer, 1939. Donées nouvelles sur la valeur et la durée de l'immunité conférée par l'anatoxine tétanique; conséquences théoriques et practiques. *C. R. Acad. Sci. Paris*, 209, pp. 704-707.

with antiserum only, there were 50 cases and 30 deaths. In the same area, containing 16,500 horses, from 1932 to 1937 when systematic vaccination with anatoxin was practiced there were no cases of tetanus among the vaccinated animals. Attention is drawn to the application of these principles to the immunization of human beings.

Gas Gangrene of Cattle and Its Prevention

Out of 39 cases (many of them deemed atypical of *Cl. chauvoei* infection) in widely scattered regions of France, Vallée[109] found gas gangrene of cattle to be due to *Vibrion septique* 11 times, *Cl. welchii* three times, *Cl. oedematiens* once, *Cl. chauvoei* with *Cl. welchii* twice, *Cl. chauvoei* with *V. septique* seven times, and *Cl. chauvoei* alone 15 times. He prepared a quadrivalent vaccinal anaculture of all four types of bacteria by mixing equal quantities of each antigen, using it as single injection of 20cc. This was used upon 16,503 animals. Under the very variable conditions there were no bad sequelae and the method was efficient according to all indirect methods of judgment, all vaccinated animals remaining healthy, whereas gas gangrene occurred in the same areas in untreated animals.—*C. V. Watkins.*

Actinomycosis in Dogs and Cats

Actinomycosis is common in cattle and occurs in other animals. However, it is considered a very rare infection in the domestic carnivores. The references to this subject in veterinary literature are scattered and incomplete. The author[105] has done extensive research on this disease in cats and dogs.

Actinomycosis has no particular site of predilection in the dog and cat as it does in other animals. However, cutaneous actinomycosis is more common in these animals than are internal lesions. The lesions are usually characterized by abscesses and phlegmons, chiefly on the extremites. Sometimes, suppuration may penetrate deeply and reach the muscles, and reactions in the lymphatic glands may occur. Local applications of iodine and potassium iodide are not sufficient as a treatment; surgical intervention is essential.

The author observed two cases of actinomycosis in cats which were localized in bones: one in the forearm, with many actinomycotic abscesses and a rapid rarefying osteitis of the radius; the other in the lower jaw, with lesions similar to those observed in cattle.

Studies on the Diagnosis of Subcutaneous Emphysema

Experiments were undertaken to determine whether each of the gas-producing organisms has its own biological properties; particularly whether any group immunity occurs among these organisms. The test animals, guinea pigs and sheep, were first immunized and then infected. The first group, including eight sheep and eight guinea pigs, was given *Cl. chauvei* vaccine; the second, *Cl. septicus* vaccine; the third, *Cl. oedematiens* vaccine; and the fourth, *Cl. welchii* vaccine.

Then two guinea pigs and two sheep from each group were infected with *Cl. chauvei, Cl. septicus, Cl. oedematiens,* and *Cl. welchii,* respectively, with the following results:

1. The guinea pigs and sheep vaccinated against *Cl. chauvei* survived infection with that organism, but did not survive infection with the other three organisms.

2. The animals given *Cl. septicus* vaccination survived the *Cl. septicus* injection, but succumbed to *Cl. chauvei, Cl. oedematiens,* and *Cl. welchii* infection.

3. The animals vaccinated against *Cl. oedematiens* succumbed to *Cl. chauvei, Cl. septicus,* and *Cl. welchii* infection; half of the animals (one guinea pig and one sheep) injected with *Cl. oedematiens* also succumbed, while the other two survived.

4. Of the animals vaccinated against *Cl. welchii,* all succumbed to the successive infections except the four injected with *Cl. welchii,* which all survived.

It therefore can be stated with certainty that these four organisms are immunologically distinct.

[109] Vallée, M., 1940. Sur les gangrènes gazeuses des bovidés et sur leur prévention. *C. R. Soc. Biol. Paris,* 131, pp. 51-52. Abst. in *Vet. Bul.* 11:5; p. 288.

[105] Brion, A., 1939. L'actinomycose du chien et du chat. *Rev. Méd. Vét.,* March, 1939, p. 121. Abst. in *Rec. de Méd. Vét.* 115:12, p. 883.

Announcing two new Lederle products

FELINE-DISTEMPER VACCINE

(Killed Virus)

TISSUE SUSPENSION

Lederle

A PROPHYLACTIC AGENT for immunization against feline distemper which is also synonymously referred to as infectious gastro-enteritis of cats, infectious panleucopenia, and infectious feline agranulocytosis.

This vaccine has been shown by repeated trial to induce solid immunity against natural or artificial exposure, when given in two injections of 2 cc. each, subcutaneously, at a 7-to 10-day interval.

PACKAGES:
2-2 cc. vials
10-2 cc. vials

LEPTOSPIRA ANTIGEN

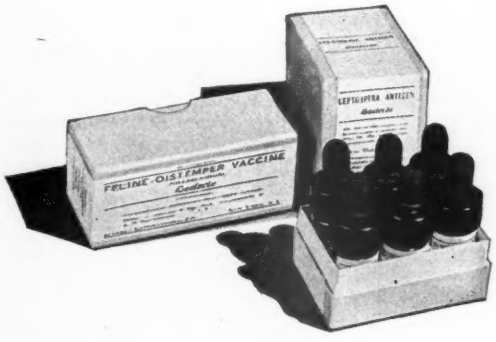
(Stained)

Lederle

FOR THE RAPID PLATE determination of significant agglutinins for *Leptospira canicola* and *Leptospira icterohemorrhagiae* in clear serum (Stuttgart's disease in the dog and Weil's disease in man).

The first diagnostic agent made available as an aid in the detection of leptospirosis, now recognized as an increasing public health problem.

PACKAGES:
"Leptospira Antigen *Lederle*"
1-5 cc. Vial, each—
Leptospira canicola
Leptospira icterohemorrhagiae
Bivalent Positive Serum
3-5 cc. dilution vials



Literature available on request.

LEDERLE LABORATORIES
INC.
30 ROCKEFELLER PLAZA
NEW YORK, N. Y.

You'll Be Interested to Know That . . .

A Wisconsin veterinarian, Dr. M. W. Downing, owns the largest individual strawberry acreage in the state. . . . Starting with a small garden patch in 1929, Doctor Downing has added to it until he now has 15 acres under cultivation. So far, 1935 has been his peak year, a total of 6,000 crates being filled. . . . Downing berries are well known in Wisconsin for their high quality.

■

Have you ever wondered whether chimpanzees are right-handed or left-handed? Glen Finch of the Yale Laboratories of Primate Biology has studied this problem, finding in elaborate trials with 30 chimpanzees that 25 exhibited marked handedness, about equally distributed between right- and left-handedness, while the other five were apparently ambidextrous. . . . Whether you have wondered about it or not, now you know.

■

We hear that the English regulations against smoking in airplanes, in munitions factories, and during blackouts, together with the scarcity of cigarettes, have caused the English people to revert to the use of snuff. Again it has become genteel to "sniff the snuff."

We thought the stuff
Had had its day,
Was gone for good
Like the one-horse shay—

but it seems we were wrong. . . . War has some curious by-products. A few weeks ago the *Chicago Tribune*, self-styled "The World's Greatest Newspaper," headlined, apparently as the most important news of the day, WOMEN FIGHT FOR SILK STOCKINGS.

■

For some time the World Calendar Association, Inc., has been showering us, and presumably others, with literature about the desirability of changing our present erratic and unscientific calendar to a new, more orderly arrangement. . . . The Association (which includes, by the way, a good many notable names) puts up a good case for its proposed calendar, and we will admit it looks pretty sensible to us. . . . If you are interested in the details, the Association (630 Fifth Avenue, New York City) will be glad to supply you with them. . . . Perhaps the most interesting feature of the scheme to us is the disposition of the day left over after the year has been divided neatly into quarters. This will be placed at the end of the year, entitled Year-End Day, and designated as a World Holiday, dedicated to unity and brotherhood. . . . We don't know whether to classify that as optimism or wishful thinking; but we like it.

How do you pronounce Holstein? Delegates to the 56th annual convention of the Holstein-Friesian Association of America, meeting at Lansing, Mich., June 4th, voted that it should be "Holstein" and not "Holsteen"—the last syllable being pronounced exactly like the stein that holds beer.

■

According to the *Detroit Free Press*, a farmer named Joseph Berlanger, who lives near Harris, Michigan, underwent a harrowing experience recently when lightning struck a cow that he was milking. The bolt shattered the milk stool on which he was sitting, pinned him under the dead cow, and set the barn on fire. . . . Fortunately, his wife was able to extricate him, unhurt, before the barn burned down. . . . Fourteen head of young stock, ten cows, and two horses were also rescued in time. . . . The happy ending of this rural catastrophe should sound a reassuring note for those who are feeling pretty gloomy about world events.

■

The *Houston Press* of July 14th refers to and quotes from an article in the July issue of VETERINARY MEDICINE entitled "Rabies Capital Moved," which read in part, "Birmingham, Ala., which for several years has merited the distinction of being the principal rabies center in the United States, must give way to Houston, Texas, if that dubious bid to notoriety is to be awarded on the record for prevalence." . . . The *Press* quotes Dr. John W. Brown, the City Health Commissioner of Houston, as commenting, "Those are the absolute facts, shameful as they are for a city of this size and distinction in other fields."

■

Two new sound films have been prepared recently by the U. S. Department of Agriculture in cooperation with the National Live Stock Loss Prevention Board. One, entitled "Do Unto Animals," portrays the right and the wrong methods of loading, transporting, and unloading live stock. The other deals with avian tuberculosis, calling attention to the enormous losses of poultry caused by this disease, as well as to the hazard of its communication to swine. . . . The films are being shown quite generally in the midwest by humane societies and vocational teachers, and even in many city theaters. . . . Those interested in obtaining a copy of either film to show at meetings, or in the local theater, should apply to the National Live Stock Loss Prevention Board, 700 Exchange Building, Union Stock Yards, Chicago, Ill.

THE VETERINARY RECORD

Founded 1888

A weekly journal for the Profession.

Published by the

NATIONAL VETERINARY MEDICAL ASSOCIATION

of Great Britain and Ireland

36 Gordon Square
LONDON W. C. 1.
ENGLAND

Subscription. £2.12.0 per annum.

VITAMINS SUPPLY VIGOR and VIM

Our
Vitamin A-B-D-G
3 Minim Capsules

ARE JUST THE THING FOR THAT DOG THAT IS NOT DOING SO WELL

Easy to administer by your clients after their pets are taken home.

Per ½ gross.....$1.25 Per gross.....$2.25

IF YOU PREFER VITAMINS IN POWDER FORM DON'T FORGET

Goshen Mineral Yeast
(Canine)

IT CONTAINS ALL THE VITAMINS LISTED ABOVE — ALSO VITAMIN E

Especially beneficial for the bitch in whelp.

Per Doz. 6-oz. cans.....$2.75
Per Doz. 1-lb. cans.....$5.50
Bulk Packages Priced Proportionately

J. F. DeVine Laboratories, Inc.
Goshen, New York

Your Ally in Today's Emergency...

ARMOUR'S "FOWLER BRAND" ANTI-HOG CHOLERA SERUM

● Today, your battle against Hog Cholera is of increasing importance.

For you are shouldering much of the responsibility for seeing that more and more livestock goes to market to meet the Nation's food needs.

In this emergency, make Armour's Fowler Brand Serum your daily ally.

This dependable and effective serum is produced under the supervision of graduate veterinarians, by the most modern techniques.

And it is backed by the resources of Armour and Company... great resources of material, equipment and experience... that assure its unvarying quality.

Fowler Serum and Virus are obtainable from Dr. Robert D. Wall, 910 28th Street, Des Moines; Dr. Robert J. Hoskins, 3203 East Washington Street, Indianapolis; Dr. H. W. Brown, 623 West Main Street, Fort Wayne; Mr. A. G. Carter, Findlay, Ohio; and from most Armour Branch Houses and Creameries.

ARMOUR AND COMPANY
VETERINARY DIVISION
KANSAS CITY
KANSAS

Member Associated Serum Producers

MASON'S Kennel Fences
Used by Leading Dog Hospitals
5 Runs $86.25
Pens $14.65 and up
Mason's are Real Kennel Fences—Strong, Good Looking and sold under a Money Back Guarantee to hold the largest and strongest dogs.
SEND FOR FREE CATALOG
If planning a new hospital or equipment, get this book. It quotes Low Direct Factory Prices on Kennel Fences, Dog Proof Gates, Steel Kennel Stalls and Doors.
54 Pages 147 Illustrations
MASON KENNEL FENCE CO., Box 77, Leesburg, Ohio

The Washington State Legislature has appropriated $350,000 for new veterinary buildings at the State College at Pullman. The money is available immediately, and building will be commenced at once.

■

Wisconsin fur breeders will have a fur animal show August 20-24, in connection with the state fair at Madison. Nearly $2,500 will be awarded in prizes.

■

Boneless Beef for Army Maneuvers

The 500,000 men who are engaged in maneuvers in the Louisiana sector are getting boneless frozen beef in their mess. Since field equipment is not very elaborate, the lesser bulk, the greater ease of handling and the protection against contamination afforded by this beef—all are aspects favorable to the use of the boneless product. It is estimated that 2,000,000 pounds of this frozen beef will be consumed by the troops during these maneuvers.

The procurement of the boneless beef for all the larger army posts throughout the country has been assigned to the Chicago Quartermaster Depot by the U. S. Quartermaster General. Bids will be invited each week for the 2,000,000 pounds which it is expected will be needed weekly for the army.

MIDDLESEX UNIVERSITY

School of Veterinary Medicine

Waltham, Massachusetts

✦ ✦

Four-year course leads to D.V.M. degree. New buildings for dormitories, classrooms, laboratories, animal hospital, clinic, and live stock, on 100-acre campus.

High school graduates accepted for the two-year preveterinary college course required for admission to the School of Veterinary Medicine.

Write for catalogue to

EDGAR A. CROSSMAN, M. V. D.

Dean of the School of Veterinary Medicine

It's Captain Gillie Now!

The Hon. Geo. W. Gillie, Congressman and veterinarian, and one-time sheriff of Fort Wayne, Ind., reported for duty in another capacity on July 5th. For 28 days he was a captain in the Regular Army of the United States. His tour of duty took him to Fort Bliss, Texas, where he was assigned to the First Cavalry Division. He took part in the maneuvers which were held in desertland of New Mexico. . . . Being first of all a veterinarian, it was inevitable that Capt. Gillie should choose Fort Bliss as the base for his military activities, as it is the largest cavalry post in the Army.

■

A. V. M. A. Executive Board Elections

Dr. W. L. Curtis, Pacific coast representative of the Jensen-Salsbery Laboratories, has been elected a member of the Executive Board of the American Veterinary Medical Association for District VI, comprising Arizona, California, Colorado, the Canal Zone, Central America, Mexico, New Mexico, Nevada, and Utah. . . . Dr. Ashe Lockhart, president of the Ashe Lockhart Laboratories, Inc., Kansas City, has been chosen to represent District VIII, which includes Kansas, Missouri, Oklahoma, Louisiana, and Texas.

BLACKOUT TEST

SHOWS HOW TI-O-GA SUPPLIES VITAMIN 'D'

Supplementing other vitamin tests, a recent experiment at TI-O-GA'S test kennels shows how TI-O-GA supplies both Vitamin D and growth-promoting minerals.

Four puppies were raised in a covered kennel, "blacked out" to exclude sunlight, only non-food source of the essential antirachitic vitamin.

Fed TI-O-GA alone, the puppies all passed the test with flying colors. No signs of rickets appeared. Teeth and bones grew straight and strong, clearly indicating generous proportions of Vitamin D, calcium and phosphorous in their food.

Don't take chances with the diet of the dogs in your care. Feed TI-O-GA, scientifically tested and proved on generations of dogs.

Write for Veterinary Franchise details.

BALORATIONS, Inc., Div. of Tioga Mills Inc. Waverly, N. Y., or 200 Davis St., San Francisco, Calif.

TI·O·GA

MEAL • PELLETS • PUPPY FOOD

The Complete Foods

For the Veterinarian

PHARMACEUTICALS

Specialized formulae compounded especially for the needs of the busy practitioner.

BIOLOGICS

Large stock of well known products.

INSTRUMENTS

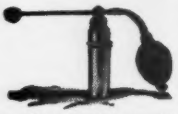
Complete line of all Veterinary instruments and sundries.

Detroit Veterinary Supply Co.

1792-98 Wabash Ave. Detroit, Michigan

Canadian Branch—Windsor, Ont.

SPECIAL
DAIRMOL DUSTING POWDER
FOR GRANULAR VAGINITIS
Antiseptic Astringent



Compounded under the direction of two veterinarians of exceptional experience.
Highly recommended by leading herdsmen as the best treatment for the purpose.
Extensively used among prominent practitioners.

"THE DAIRMOL WAY"

DALARE ASSOCIATES
DEPT. Y-91 23rd & Locust Sts. PHILADELPHIA, PA.

Mrs. Annie E. Hoskins, widow of the late W. Horace Hoskins, died June 17th at her home in Philadelphia, Pa. She was a charter member of the Women's Auxiliary to the Veterinary Relief Committee of the A. V. M. A., founded in Kansas City in 1917; this later became the Women's Auxiliary of the A. V. M. A. Mrs. Hopkins served as its president for two years. . . . She is survived by two sons, Dr. H. Preston Hoskins, Evanston, and Dr. Cheston M. Hoskins, Philadelphia.

Coming Meetings

Kansas City Veterinary Medical Association, Kansas City, Mo., August 18.

Fayette County Veterinary Association, monthly meeting, Fayette, Ia., August 19.

Southern California Veterinary Medical Association, Chamber of Commerce Building, Los Angeles, Calif., August 20.

Eastern Iowa Veterinary Association, 28th annual meeting, Hotel Montrose, Cedar Rapids, Ia., October 7-8.

Maine Veterinary Medical Association, quarterly meeting, Lewiston, Me., October 8.

University of Illinois 22nd annual veterinary conference, new Union Building, University of Illinois, Urbana, Ill., October 14-15.

Purdue University Short Course for Veterinarians, Lafayette, Ind., October 15-17.

Pennsylvania State Veterinary Medical Association, 59th annual meeting, Harrisburg, Pa., October 23-24.

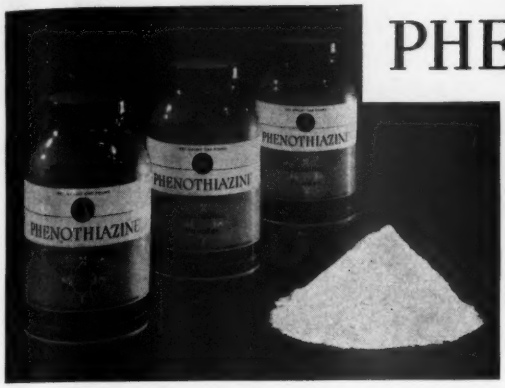
Southern Veterinary Medical Association and Florida Veterinary Medical Association (joint meeting), George Washington Hotel, Jacksonville, Fla., October 27-29.

OFFICIALS AND SPEAKERS AT NORTHWEST IOWA VETERINARY MEETING, MILFORD, MARCH 26, 1941

Standing (left to right): J. S. Koen, Storm Lake; C. D. Lee, Ames; Frank Place, Milford. Seated: Edwin Fisher, Orange City; C. C. Franks, Grimes; J. A. Barger, Des Moines; C. G. Grey, Lincoln, Nebr.

Doctors Koen, Lee, Franks, Barger and Grey appeared on the program. Doctors Place and Fisher were elected president and secretary, respectively.

Doctor Grey is in charge of serum-culture vaccination for swine erysipelas control in Nebraska and Iowa. Swine erysipelas is more prevalent in Iowa this season than at any time previously. Since most of the outbreaks were acute, however, serum-culture vaccination was not indicated and, in the main, serum alone was used. To date the serum-culture vaccination has been entirely satisfactory where it has been possible to use it. It may be administered only by special permission of the B. A. I. and the state veterinarian.



PHENOTHIAZINE

Crystalline Powder

1 lb. container	$ 0.95
5 lb. container	4.60
10 lb. container	8.80
25 lb. container	21.00
175 lb. container	120.75

SULFANILAMIDE POWDER	
1 lb. container	$ 1.75
5 lb. container	8.50
10 lb. container	16.50

SULFATHIOZOLE POWDER	lb.	$ 9.50
SULFAPYRIDINE POWDER	lb.	15.25
THIAMIN CHLORIDE POWDER	1 gm.	1.75
THIAMIN CHLORIDE POWDER	5 gm.	7.50

All prices F.O.B. Chicago

The Veterinary Division

AMERICAN CHEMICAL COMPANY, INC.

433 EAST ERIE STREET • CHICAGO, U. S. A.

Oster

The Veterinarian's Clipper

Better For You

Because

Smaller -:- Lighter
Smoother -:- Quieter

An All Year Aid

The Detachable Head feature gives you a complete service — Clipping, Plucking Length Clipping, and Surgical Shaving.

Price $19.50. **Folder free upon request.**

JOHN OSTER MANUFACTURING COMPANY
Racine, Wisconsin, U. S. A.

Effective, Convenient and Economical

THE effectiveness of Mercurochrome has been demonstrated by 20 years' extensive clinical use.

For professional convenience Mercurochrome is supplied in four forms—Aqueous Solution for the treatment of wounds, Surgical Solution for preoperative skin disinfection, Tablets and Powder from which solutions of any desired concentration may readily be prepared.

Mercurochrome, H.W.&D.
(dibrom-oxymercuri-fluorescein-sodium)

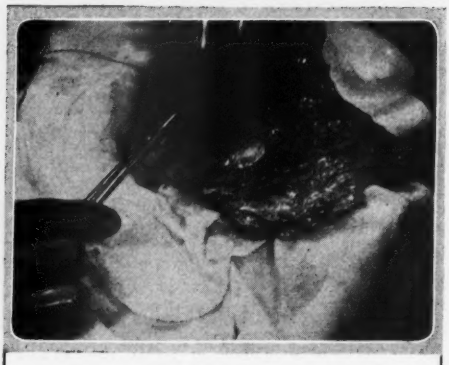
is economical because solutions may be dispensed at low cost. Stock solutions keep indefinitely.

ACCEPTED AMERICAN MEDICAL ASSN.

Mercurochrome is accepted by the Council on Pharmacy and Chemistry of the American Medical Association.

Literature furnished on request

HYNSON, WESTCOTT & DUNNING, INC.
BALTIMORE, MARYLAND



IN ANIMAL SURGERY
— AS IN HUMAN —
SPECIAL SUTURES ARE NEEDED

As the importance of suture quality has become generally recognized and repeatedly proven in veterinary surgery, there has been an increasing appreciation for the efficacy and convenience of sutures and suture-needle combinations especially designed for specific uses. Among those found particularly useful in this field are—

INTESTINAL SUTURES with swaged-on Atraumatic needles which cannot become unthreaded and which facilitate and improve stomach and intestinal work.

ABSORBABLE and non-absorbable sutures with cutting needles for tendon, muscle, and skin approximation.

SHORT LENGTH sutures in a variety of materials for convenience and economy in small animal practice.

Data on suture use and behavior and a comprehensive list of other D & G standard and special sutures will be sent upon request.

Davis & Geck, Inc., Brooklyn, N. Y.

"This One Thing We Do"

Civil Service Commission Announces Examination for Veterinarians

Because the need for veterinarians is unabated in regular Government work, and increasing for national defense activities, the Civil Service Commission has announced a new examination for Junior Veterinarians. This examination is "open continuous" and "unassembled"—that is, applications will be rated as soon as practicable after receipt, and no written test will be given.

Appointments will be made in the Bureau of Animal Industry of the Department of Agriculture. Junior veterinarians, who are paid $2,000 a year, inspect food products and perform ante- and post-mortem inspection of food animals. They administer tests for disease, and work toward its control and eradication. Sanitary inspection of establishments and plants such as packing houses is also a part of their duties.

To qualify for appointment to these positions, completion of a full course of study in a veterinary college is required. Applications from senior students will be accepted, although they cannot enter on duty until their course is completed. Applicants must not have

FISTONE

The **original** and **successful** veterinary preparation given internally that will bring the treatment of suppurative and catarrhal conditions down to a mere routine.

Let us remind you, too, that the well-being of any animal afterwards is most important, and to those who do not know — FISTONE plays its important part as a conditioner.

THE FISTONE AND APPLIANCE COMPANY
College Corner, Ohio
Trial Order—one dozen boxes (once only) ..... $ 8.00
Regular Price—one dozen boxes..... 10.00
One-half dozen boxes..... 5.00

Dr. .....

Address .....

passed their forty-fifth birthday, unless they are entitled to military preference.

Qualified persons are urged to file their applications at once. Further information and application forms may be obtained from any first- or second-class post office or from the Civil Service Commission in Washington.

■

Honor Tucker at Meeting

H. M. Tucker, recently retired Chief of the Division of Animal Industry, Maine Department of Agriculture, was honored July 9th by the largest assembly of Maine veterinarians in the history of the Maine Veterinary Medical Association. Seventy-five veterinarians, wives, and friends met at the Overlook Farm on Pleasant Lake near Casco in recognition of Mr. Tucker's 24 years of service. . . . Mr. Tucker entered the employ of the State Department of Agriculture in March, 1917, and assumed the duties of the Chief of the Division of Animal Industry in 1921. His first big objective in this position was the eradication of bovine tuberculosis, and his efforts were so successful that Maine was the second state in the union to be classed as a modified accredited area.

Internal Iodine

They eat it on the Feed

Best Oral Iodine

Soluble Iodine

Single Strength

Pint $.60 Gallon $3.50

Double Strength

Pint $.95 Gallon $5.70

CURTS-FOLSE LABORATORIES

71 Central Avenue
Kansas City, Kansas

For Potency and Dependability—

Specify

ARMOUR'S GLANDULAR PRODUCTS

☆ Highest quality in Armour's Glandular Products is assured by the accurate control of all manufacturing processes. The ingredients are carefully selected from Armour's vast quantities of raw materials. From a scientific viewpoint, the equipment and technique are of the best. Those are the reasons Armour's Glandular Products are uniformly potent and dependable.... Write today for Armour's Veterinary Products Catalog. Complete listing of Armour's glandular products, pharmaceuticals, and biologicals. Description of each item, clinical data, directions, package types, sizes . . . and prices.

ARMOUR AND COMPANY
Veterinary Division
Kansas City, Kansas

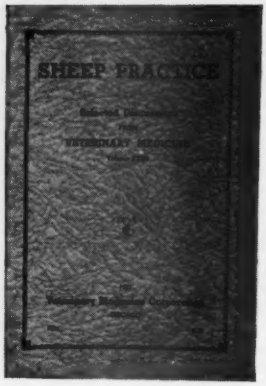
Suprarenalin Solution 1:1000

(A brand of solution of Epinephrine Hydrochloride U. S. P.) Intramuscular or subcutaneous injection, or applied locally. For use in animals, when indicated as a vasoconstrictor to control hemorrhage, cardiac and sympathetic nerve stimulant, acute anaphylactic shock, etc.

Posterior Pituitary Liquid

(Twice the strength of the U. S. P. XI). Intramuscular injection. For obstetrical and general use in animals, when indicated—uterine atony (retained placenta, etc.) post partum hemorrhage, shock, temporary low blood pressure.

SHEEP PRACTICE . . .



CONTENTS

Know Your Sheep . Jas. D. Grossman
Laboratory Consultation in Sheep Disease . . . . . S. J. Schilling
Laboratory Aid in Disease Control . . . . . B. M. Lyon
Sheep Practice in Utah . . . . . W. H. Hendricks
The Preparation of Ovine Biologics . . . . . H. J. Shore
The U. S. Sheep Experiment Station . . . . . Stanley L. Smith
Control of Some Sheep Parasites . . . . . J. H. Riets
Some Feedlot Diseases of Lambs . . . . . Frank Thorp, Jr.
White Scours (Infectious Diarrhea) of Sheep . . . . . W. H. Lytle
Care of the Farm Flock . . . . . L. J. Horlacher
Mid-Western Sheep Practice . . . . . W. L. Andrews
Sheep Practice in North Dakota . . . . . T. O. Brandenburg
California Farm and Ranch Sheep Raising . . Hugh S. Cameron
Sheep Husbandry in Wisconsin . . . . . Walter Wisnicky
Management of Range Sheep . . . . . H. B. Soulen
Nodular Disease . . . . . T. O. Booth
Diseases of Range Angora Goats . . . . . I. B. Boughton
Rabies and the Sheep Industry . . . . . H. W. Jakeman
Protection for Baby Lambs . . . . . W. H. Lytle
Some Eastern Poisonous Plants . . . . . A. B. Massey
Big Head (Photosensitization) of Sheep . . . . . W. H. Lytle
Sheep Breeding in Mexico . . . . . Jose Figueroa
Experience with Sheep in Several Lands . . . . . Guy A. Roberts
Foot-Rot . . . . . E. T. Baker

And a number of others, including abstracts, useful prescriptions, and practical suggestions.

New advances in technique are described by word and picture
Profusely illustrated

Paper bound; 64 pages; price $1.00, Prepaid

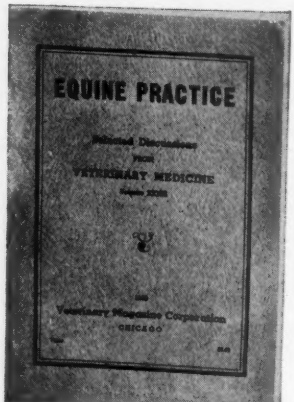
VETERINARY MAGAZINE CORPORATION

7632 S. Crandon Ave. **Chicago, Illinois**

EQUINE PRACTICE

CONTENTS

Horse Practice, Then and Now . . . L. A. Merillat
Equine Practice . . . . . E. T. Baker
Equine Encephalomyelitis . . . . . H. W. Schoening
Treatment of Encephalomyelitis . . . . . E. L. Nye
Cryptogamic Poisoning in Horses . . . . H. Fulstow
Nursing in Encephalomyelitis . . . . . S. L. Stewart
The Kansas Horse Plague and Encephalomyelitis . . . . . J. R. Zecha
Intestinal Parasites in Horses . . . . . Frank Hare
Strongylidae of the Horse . . . . . E. A. Benbrook
Brain Fever in Brief . . . . . H. R. Groome
Tetanus in a Parturient Mare . . Samuel Burrowes
Treatment for Tetanus . . . . . John H. Woolsey
Clinical Picture of Encephalomyelitis . . . . . R. S. Gerard
Equine Breeding Problems . . . . . J. F. DeVine
Bicornual Pregnancy . . . . . Georg Lichtenstern
Equine Impactions . . . . . S. L. Stewart
A Few Colic Treatments . . . . . E. V. Hover
Experience with Lang's Solution . . . Vile T. Rose
Equine Impaction . . . . . E. T. Baker
Equine Intravenous Medication . . E. B. Ingmand
Recurrent Ophthalmia . . . . . Carl F. Schlotthauer
Etiology of Periodic Ophthalmia . . . P. Mintschen
Cryptorchidism in Horses . . . . . E. E. Wegner
Operations on the Tail . . . . . T. A. Sigler
Operation for the Relief of Roaring . T. A. Sigler
Castration of the Horse . . . . . T. A. Sigler
Diseases of the Foot of the Horse . . C. R. Fowler
Punctured Foot Wounds . . . . . Samuel Burrowes
Equine Influenza . . . . . Frank Hare
Saliva Testing of Race Horses . . . . L. L. Newman



The discussions are profusely illustrated—altogether 119 illustrations.

Paper Bound; 96 Pages
PRICE $1.00, PREPAID

VETERINARY MAGAZINE CORPORATION

7632 S. Crandon Ave. **Chicago, Ill.**

FREE FOLDER FOR VETERINARIANS . . outlining the treatment of various infections with
● Also Price List quoting veterinary hospital discount price
SULFANILAMIDE SQUIBB
(Para-Amino-Benzene-Sulfonamide)
E. R. SQUIBB & SONS Veterinary and Animal Feeding Products Div 745 FIFTH AVE., NEW YORK

Deaths of Veterinarians

Chester Llewellyn Wallace, 55, Woodstock, Ont., Ontario Veterinary College '10, March 29.

J. Arthur Royce, Lincoln, Neb., Ontario Veterinary College '01, April 8.

Nathan E. Rice, 67, Albany, N. Y., Western Veterinary College (Kansas City, Mo.), private veterinarian for former Governor John A. Dix, May 12.

Joseph E. Davis, Chrisman, Ill., Indiana Veterinary College '10, May 14.

Charles A. Raque, 70, San Diego, Calif., American Veterinary College '93, for many years in B. A. I. service, stationed at San Luis Obispo, Calif., Denver, Colo., and Phoenix, Ariz., retiring in 1936; May 20.

James F. Carey, 68, Lambertville, N. J., New York-American Veterinary College '07, May 23.

Robert Lewis Berger, 52, Shartlesville, Pa., Grand Rapids Veterinary College '11, secretary of the Schuylkill Valley Veterinary Medical Association since 1917; engaged in general practice and state sanitary control work; active in many community and county organizations, May 29.

Ellis E. McCoy, 62, Staunton, Va., Kansas City Veterinary College '07, in B. A. I. employ for years, past president of the Virginia State Veterinary Medical Association, June 22.

H. E. Erickson, 67, Milledgeville, Ill., Ontario Veterinary College '07, practiced at Kirkland and Rochelle, Ill., coming to Milledgeville in 1916, served three two-year terms as village president of Millidgeville, June 28.

Joseph N. Holzer, 50, Minneapolis, Minn., U. S. College of Veterinary Surgeons '12, B. A. I. service since 1913, July 1.

E. P. Stanton, 47, Florence, S. C., July 2.

Wm. A. Frank, 78, Victoria, Tex., practiced in Victoria for many years; during the last several years operated the Victoria County Indigent Hospital July 7.

Archie R. Madson, 56, Mishicot, Wis,. July 9.

Maj. Fred R. Pettys, Cleveland, O., 38th Division Veterinarian at Camp Shelby, Miss., killed in an automobile accident July 25.

W. W. Lichty, 60, Woodstock, Ill., widely known 25 years ago for his stable of trotting horses, served for a time as assistant state veterinarian, and as milk inspector of Woodstock; member of the Woodstock Board of Education, July 26th.

THERAPOGEN

is ideal for cold sterilization of instruments. Does not rust metal nor cause hard rubber to deteriorate

Samples & Literature

THEODORE MEYER EST.
213 S. Tenth Street
Philadelphia, Pa.

"My Dogs Thrive on a Base of Red Heart Dog Biscuits!"

Champion Hertzville Hottentot, owned by Chris J. Cassleman and Thomas M. Halpin, operators of the Hertzville Kennels, Chicago, Ill., is one of many collies kept in top-notch health on a diet of Red Heart Canned Dog Food and a *base* of Red Heart Dog Biscuits.

Red Heart Dog Biscuits Help Keep Dogs in Sound Health

● Like many well-known kennel operators and veterinarians, Chris J. Cassleman depends upon a *base* of economical Red Heart Dog Biscuits to supplement his dogs' diet with an abundance of essential vitamins, minerals, and iodine. He has discovered, too, that the scientifically developed Morrell Feeding Plan* is an effective, *low-cost* way to keep dogs in robust health.

Advise your clients to promote normal development and sound health by feeding Red Heart Dog Biscuits as a *base* for ration formulas. Red Heart Dog Biscuits are made from fresh meat, meat and bone scraps, marrow meat and bone, dry skimmed milk, fresh egg yolk, cereals, malt, and wheat germ. They furnish a rich supply of Anti-infective Vitamin A, Anti-neuritic Vitamin B_1, and Sunshine Vitamin D.

You can recommend Red Heart Dog Biscuits with confidence. Available heart-shaped, kibbled, or meal—in bulk or package. Each package contains 3 *delicious flavors*... beef, fish, and cheese. If your dealer cannot supply you, write John Morrell & Co., General Offices, Ottumwa, Iowa.

***MORRELL FEEDING PLAN:** *(parts by weight) 4 parts Red Heart Canned Dog Food (rotating Diets A, B, and C), 1 part water or milk, and a* base *of 1 part Red Heart Dog Biscuits.*

RED HEART DOG BISCUITS

THE 3 FLAVOR

A BASIC FOOD FOR VETERINARIANS TO FEED